Republic of Seychelles

TECHNOLOGY ACTION PLAN – MITIGATION

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SEYCHELLES TECHNOLOGY ACTION PLAN REPORT – MITIGATION

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FOREWORD

Seychelles had made a great impact in the international arena in championing the cause of Small Island Developing States and the fight against climate change. We have already made great progress towards a sustainable and climate-resilient future. Our environmental legislation to ensure sustainable tourism and fishing is some of the strongest in the world. Nearly half of our land and one third of our vast marine territory are already protected.

As a SIDS, climate action and sustainable development are a matter of survival. They are two mutually reinforcing sides of the same coin. Storms, coastal erosion and rising sea levels can halt and reverse sustainable development initiatives in a matter of hours or days. Our Blue Economy initiative is drawing the world's attention by linking the alleviation of poverty and improved food security with reduced environmental risks and ecological imbalances.

Recognizing that resilience to climate change is essential to support a people-centered development strategy, Seychelles adopts forward-thinking, innovative approaches to cope with expected climate change impacts. International partnerships are forged to exchange information and invest in innovative climate resilient development pathways, technology development and transfer. National polices and institutions are aligned with needs to build adaptive capacity. Improved access to climate finance, information and services, is supported by leveraged investment in low carbon climate resilient technologies and industries, such as water resource management, renewable energy, and others.

Therefore undertaking the "Technology Needs Assessments and Technology Action Plans Report for Climate Change Mitigation in Seychelles" is key in our fight to combat climate change. As you all are aware science and technology are importance tools for implementing mitigation measures for both developed and developing countries. The latter, in particular, has become more pressing to develop and acquire key technologies to cope with climate change, including disaster in various forms and severity. A lot has already been done to respond to climate change and yet the threat remains huge that more needs to be done with even greater urgency. In conducting the TNA process, consultation with key stakeholders was the core approach taken at every stage. Stakeholders scored and identified the sectors and technologies that needed to be given priority in devising the needed actions. They went on to identify the barriers that would hinder the diffusion of the selected technologies and specified measures required to overcome the barriers. I am grateful to the stakeholders who participated in the process over a period of about two years. Thus, the TNA Report provides an assessment of the priority technology requirements and action plans for climate change mitigation activities in Energy and Transport sectors. I am convinced that this exercise has been a nationally driven process involving local expertise and knowledge supplemented by international experiences.
In fulfilment of the Government's firm commitment towards taking appropriate national actions for tackling climate change related issues and also collaborative obligations to the international community in this context, I have great pleasure in presenting the Seychelles'

National Report on Technology Needs Assessment and Technology Action Plans for Climate Change Mitigation in Seychelles to the policy makers, potential investors, technology developers, scientists and all other stakeholders who are actively participating in sustainable development efforts of the country. I also recommend this report for consideration and emulation of the world community and invite them to be partners in achieving our economic, environmental and social development goals.

I thank our partners, the United Nations Environment Programme (UNEP) and the UNEP DTU Partnership (UDP) in collaboration with the Regional Centre Energy Research Centre, and GEF for the financial support rendered to the TNA process in Seychelles. It remains for all of us to work together to ensure that the results of this intense and elaborate process will result in tangible and practical initiatives on the ground.

We need action from everyone, everywhere. All sectors of society must be involved: government, businesses and civil society. As a Small state we have big ideas and big political will. Our experiences, commitment and insights will be invaluable as we implement the TNA Action Plans, we therefore need the support of everyone to build on the progress we have already made.

Hon. Didier Dogley
Minister for Environment, Energy and Climate Change

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List of Acronyms

BAEF	Barriers Analysis and Enabling Framework
CAGR	Compound Annual Growth Rate
CC	Climate Change
CCGT	Combined Cycle Gas Turbine
CCM	Climate change mitigation
CO_2	Carbon Dioxide
DECC	Department of Energy and Climate Change
DoT	Department of Transport
EE	Energy Efficiency
EIA	Environmental Impact Assessment
EST	Environmentally Sound Technologies
GCF	Green Climate Fund
GDP	Gross Domestic Product
GEF	Global Environment Facility
GHG	Greenhouse Gas
GIS	Geographic Information System
GWP	Global Warming Potential
GPS	Geospatial Positioning System
HFO	Heavy Fuel Oil
IMF	International Monetary Fund
INDC	Intended Nationally Determined Contribution
IPP	Independent Power Producer
JICA	Japan International Cooperation Agency
$ktCO_2$	Kilotonne carbon dioxide
ktoe	Kilotonne of oil equivalent
LED	Light Emitting Diode
LULUCF	Land Use, Land Use Change and Forestry
LWMA	Landscape Waste Management Agency
MAED	Model for Analysis of Energy Demand
MCA	Multi Criteria Analysis
N_2O	Nitrous Oxide
NDS	National Development Strategy
MEECC	Ministry of Environment, Energy and Climate Change
MFTEP	Ministry of Finance, Trade and Economic Planning
MLUH	Ministry of Land Use and Habitat
MWh	Megawatt hour
NCCC	National Climate Change Committee
NCCS	National Climate Change Strategy
NGO	Non-Government Organisation
NISTI	National Institute of Science, Technology and Innovation
NSB	National Statistics Bureau
PM	Particulate Matter
PPA	Power Purchase Agreement
PSC	Project Steering Committee
PTC	Praslin Transport Company
PUC	Public Utilities Corporation
PV	Photovoltaics
RE	Renewable Energy
RTC	Road Transport Commission
SBS	Seychelles Bureau of Standards

SEC	Seychelles Energy Commission
SEEREP	Seychelles Energy Efficiency and Renewable Energy Program
SIDS	Small Island Developing States
SLA	Seychelles Licensing Authority
SLTA	Seychelles Land Transport Agency
SME	Small and Medium Enterprises
SMS	Seychelles Meteorological Services
SNC	Second National Communication
SPTC	Seychelles Public Transport Corporation
SR	Seychelles Rupee
SSDS	Seychelles Sustainable Development Strategy
SSP	Seychelles Strategic Plan
SMVDA	Seychelles Motor Vehicle Dealers Association
t	tonne
TAP	Technology Action Plan
tCO_2	Tonne carbon dioxide
TMP	Transportation Master Plan
TNA	Technology Needs Assessment
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
US$	United States Dollar
VTMP	Victoria Traffic Management Plan
WTE	Waste-to-Energy

Executive Summary

The Technology Action Plan (TAP) Report is the third and final report under the Seychelles Technology Needs Assessment (TNA) project. The TAP Report documents the Actions and Activities that emanate from an inclusive, multi-stakeholder process for promoting climate change mitigation technologies in the power sector and land transport sub-sectors through the removal of financial and non-financial barriers, and the creation of appropriate enabling environment for technology uptake and diffusion. The Actions are derived from the measures that were identified in the Barriers Analysis and Enabling Framework (BAEF) Report, namely the second report generated under the Seychelles TNA project. Each TAP provides a multi-annual action plan with budgeted activities, and accompanied by a logical framework with objectively verifiable indicators, and a risk and contingency matrix in order to achieve long-term (2030) technology penetration targets with quantifiable greenhouse gas (GHG) emission reduction opportunities. Further, each TAP lists the national stakeholders that will be responsible for the planning and implementation of the Activities that are proposed.

The TAPs will be useful to a broad audience, including policy makers, technology analysts, suppliers and end users of the proposed mitigation technologies, researchers, the private sector, and local, regional and international financial institutions. Importantly, the TAPs can be used to inform the post-2018 dialogues planned to review and to increase the ambition of the mitigation targets that were proposed in the Seychelles Nationally Determined Contribution.

While all Activities and Actions would need to be implemented in order to achieve the ambitions set in the TAPs, there are nevertheless 'low-hanging fruits' that can be achieved in terms of taking strides towards achieving the final technology targets. Therefore, a selected set of Activities presented in the TAPs have been retained for fast-tracking technology implementation in the form of Project Ideas (PIs). In short, the PIs contain the 'must-haves' in order to achieve the proposed technology targets. The rationale for selecting the Activities or Actions comprising the PIs is based on immediate urgency of action; the capacity to create an enabling environment that is supportive of the implementation of the other Actions/Activities; and ability to support the uptake of several mitigation technologies simultaneously.

The following sections summarise the main contents of the TAPs and PIs for the power sector. The summary states the mitigation technology, its ambitions and sustainable development benefits; lists the Actions proposed to reach a particular technology penetration target; provides an estimate of expected costs and their proposed sources of funding; and describes the contents of the Project Ideas.

Technology Action Plans (TAPs) and Project Ideas (PIs) for the Power Sector
Three TAPs and three PIs have been developed for the power sector.

Action Plan for Waste Heat Recovery at Roche Caiman power station

Ambition and benefits
A total capacity of 12 MW will be installed in two stages: 5 MW in 2020 and an additional 7 MW in 2028. The relatively high level of ambition underlying the set target is seen when it is compared to the total installed capacity at the Power Station C (Roche Caiman) of 76 MW, and with peak demand reaching 56 MW.

The sustainable development benefits of the TAP are: (1) cumulative direct GHG emission reductions in 2030 of ~361 $ktCO_2$ per year; (2) creation of 55 direct green jobs; and (3) a cumulative avoided cost on energy bill to 2030 of ~US$ 80 million. Another benefit of the technology is its relatively small land surface area requirement that has been estimated at ~0.1 ha.

Proposed Actions and timeline for implementation

Action 1: Government guaranteed loan denominated in foreign exchange – Urgent start in year 1 (Q4-2018) and completed by year 2 (2019);

Action 2: Updating the Energy Act 2012 to allow private participation in the power market – Initiated in year 1 with the legislation updates completed within the first 18 months of implementation start. It is also envisaged that the policy and accompanying legal and regulatory frameworks will be updated, if needed, in 2027;

Action 3: Institutional strengthening – The activities will be initiated in year 2 (2019), and overseas study tours for the staff of the energy regulator will be carried out every 3 years (i.e. 2019, 2022, 2025 and 2028). The institutional set ups will take place over a longer period of time, with the energy efficiency and renewable energy unit at Ministry of Environment, Energy and Climate Change being established in 2019-2020, and the arbitration court established in 2021;

Action 4: Skills enhancement in waste heat recovery – This Action will be synchronised with the period of installation and commissioning of the technology, which is expected to take place in 2019 (year 2) and 2020 (year 3).

Estimation of costs of actions and activities

The TAP is estimated at US$ 340,000 that will be funded through a combination of cash/grant (US$10,000 from government and US$293,000 from donors and development partners) and in-kind financing (US$37,000 from public institutions).

Action Plan for Waste to Energy using Centralised Biodigester

Ambition and benefits

The target is to generate 4 MW of grid-fed power from centralised anaerobic digestion of landfill waste by 2020.

The sustainable development benefits of the TAP are: (1) cumulative direct GHG emission reductions in 2030 of ~209 $ktCO_2$; (2) creation of 52 direct green jobs (combination of construction and implementation, and operation & maintenance, O&M); and (3) a cumulative avoided cost on energy bill to 2030 of ~US$ 44.8 million. Another benefit of the technology is the reduction in space needed for landfilling municipal solid waste.

Proposed Actions and timeline for implementation

Action 1: Set up appropriate FiT scheme – Urgent start in year 1 (Q4-2018) and completed in year 2 (Q2-2019);

Action 2: Updating the Energy Act 2012 to allow private participation in the power market – This action will be initiatied at the beginning of year 2 (Q1-2019), with the legislation updates completed within the first 9 months of implementation start. It is also envisaged that the policy and accompanying legal and regulatory frameworks will be updated, if needed, in 2027. The transparent technology bidding process will be carried in year 2;

Action 3: Institutional strengthening – The activities will be initiated in year 2 (2019), and activities such as the setting up of an Arbitration Court will take place in 2021;

Action 4: Skills enhancement in waste to energy – This Action will be synchronised with the period of installation and commissioning of the technology, which is expected to take place in 2021 (year 3). Preparation and planning will start in year 2 (2019); and

Action 5: Solid waste chatracterisation – Detailed chatracterisation of municipal solid waste on the three populated island of Seychelles will be carried out over a 12 months period in 2019 in order to account for seasonal trends in waste generation.

Estimation of costs of actions and activities

The TAP is estimated at US$ 391,000 that will be funded through a combination of cash/grant (US$57,500 from government and US$330,000 from donors and development partners) and in-kind financing (US$3,500 from public institutions).

Action Plan for Biomass Power Generation

Ambition and benefits
The target is to generate 5 MW of grid-fed power from the combustion of biomass feedstocks by the end of 2025.

The sustainable development benefits of the TAP are: (1) cumulative direct GHG emission reductions in 2030 of ~119 $ktCO_2$; (2) creation of 61 direct green jobs (combination of construction and implementation, and O&M); and (3) a cumulative avoided cost on energy bill to 2030 of ~US$ 28 million.

Proposed Actions and timeline for implementation

Action 1: Set up appropriate FiT scheme – Urgent start in year 1 (Q4-2018) and completed in year 2 (Q2-2019);

Action 2: Updating the Energy Act 2012 to allow private participation in the power market – Action will be initiatied at the beginning of year 2 (Q1-2019), with the legislation updates completed within the first 9 months of implementation start. It is also envisaged that the policy and accompanying legal and regulatory frameworks will be updated, if needed, in 2027. The transparent technology bidding process will be carried in year 2;

Action 3: Institutional strengthening – The activities will be initiated in year 2 (2019), and activities such as the setting up of an Arbitration Court will take place in 2021;

Action 4: Skills enhancement in biomass for power generation – This Action will be synchronised with the period of installation and commissioning of the technology, which is expected to take place in 2025 (year 7). Preparation and planning will start in year 3 (2021); and

Action 5: Biomass resources assessment – The characterisation will be completed over a 12 months period in 2022 order to account for seasonal trends in biomass resources that can be harvested.

Estimation of costs of actions and activities
The TAP is estimated at US$ 447,000 that will be funded through a combination of cash/grant (US$55,000 from government and US$380,000 from donors and development partners) and in-kind financing (US$12,000 from public institutions).

PIs for the Power Sector

1. *Project Idea 1 - Multi-technology enabling environment*: All proposed mitigation technologies are expected to be implemented by a private partner. In this respect, the Energy Act 2012 will need to be updated in order to allow private participation in power generation in Seychelles. Further, the SEC needs institutional strengthening in order to allow it to better play its role as a regulator for promoting the mitigation technologies. The PI is expected to cost US$53,000 over 2 years;
2. *Project Idea 2 - Technical assessments as technology enablers*: The implementation of all three technologies reply on studies that will demonstrate technical feasibility. In the cases of waste-to-energy and biomass for power generation, detailed characterisation of resources in solid waste and biomass feedstocks are needed. Such data are needed for private proponents to finalise their business models. For waste-heat-recovery, a techno-economic feasibility study is proposed. The PI is expected to cost US$333,000 over 4 years; and
3. *Project Idea 3 - Feed-in-Tariffs for renewable energies:* The TAPs for waste-to-energy and biomass for power generation have proposed the adoption of FiTs as a means of overcoming financial barriers. FiTs also provide potential investors with long-term financial visibility regarding their proposed business models, especially for renewable energies that have relatively high upfront capital costs. The PI is expected to cost US$130,000 over 2 years.

Technology Action Plans (TAPs) and Project Ideas (PIs) for Land Transport

Three TAPs and two PIs have been developed for land transport. Since the barriers faced by e-scooters are identical to those faced by hybrid and electric cars, the TAP for e-scooters can be seen as a subset of the TAP for low-carbon cars. Consequently, on PI has been developed for hybrid and electric cars, and e-scooters. It is pointed out that an incremental approach has been used to budget the TAP for e-scooters in order to integrate it as a subset of the TAP for Low Carbon Car Fleet.

Action Plan for Low-Carbon Car Fleet (hybrid and electric cars)

Ambition and benefits
By 2030, 70% and 10% of the total car fleet are hybrid or electric vehicles, respectively. In absolute terms, these targets represent an increment of 2,423 electric and 16,785 hybrid cars over the 2015 baseline.

The sustainable development benefits of the TAP are: (1) direct GHG emission reductions in 2030 of ~12.5 $ktCO_2$ per year; and (2) an avoided cost on energy bill in 2030 of ~US$ 2.8 million. Another benefit of the technology is that it does not entail incremental land use compared to conventional cars.

Proposed Actions and timeline for implementation

Action 1: A subsidy on loan interest for hybrid and electric cars – It is planned for implementation early in the TAP lifetime – i.e. 2019. While the scheme will be set up upfront, its monitoring and review (Activity 1.3) will probably span most of the target period – i.e. 2030. The thinking is that the subsidy scheme has to be monitored to avoid unnecessary economic losses as the prices of low-carbon car technologies decrease with increasing market penetration and technology maturity;

Action 2: Establish authorised dealership for low carbon cars – While necessary to create the enabling conditions for the medium-to-long term acceptability of the proposed technology options, it is not of immediate concern. It will be implemented in 2020; and

Action 3: Training of qualified technicians to carry out repairs and maintenance –The activities will be initiated in year 2 (2019), with accredited trainings delivered in 2020.

Estimation of costs of actions and activities
The TAP is estimated at US$ 140,500 that will be funded through a combination of cash/grant (US$3,000 from government and US$133,000 from donors and development partners) and in-kind financing (US$7,500 from public institutions).

Action Plan for Victoria Traffic Management Plan (VTMP)

Ambition and benefits
The VTMP is expected to reduce national GHG emissions in 2030 by 5%. Modelling carried out in the TNA project has assumed that the impacts of the VTMP will increase gradually from 25% in 2020 to 50% in 2021 to 75% in 2022. Cumulative emission reductions of ~68.6 $ktCO_2$ will be achieved between 2020 and 2030

The sustainable development benefits of the TAP are: (1) direct GHG emission reductions in 2030 of ~8.4 $ktCO_2$ per year; and (2) avoided cost on energy bill in 2030 of ~US$ 1.67 million per year (or cumulative avoided cost of ~US$ 13.7 million between 2020 and 2030). The VTMP will require an estimated 7 ha of land to increase the road network. The TNA project has estimated that the VTMP will avoid economic losses due to traffic congestion equivalent to ~US$ 35 million per year in 2030, and cumulative avoided economic losses of ~ US$ 309 million between 2020 and 2030.

Proposed Actions and timeline for implementation

Action 1: Low interest loan denominated in foreign currency – The detailed benefit cost analysis planned under Action 1 cannot be carried out until Action 5 has been completed. Consequently, this action will be carried out in 2020;

Action 2: Official endorsement of the SSP – Action 2 will take place after the completion of Actions 5 and 1. The updated and revised SSP is therefore planned for endorsement in late 2020;
Action 3: Setting up inter-ministerial VTMP oversight committee –This Action will form part of the PI and it will be implemented upfront. The inter-ministerial oversight committee will be set up in 2019, and the same structure can be used as the TAP steering committee;
Action 4: Increased knowledge and skills of stakeholders in technical areas related to the project – Since this Action is of moderate urgency, it will be implemented in 2019 and 2020; and
Action 5: Technical options to improve the VTMP – This Action is a crucial one, since it is a pre-requisite for carrying out Actions 1 and 2. For this reason, it has been included in the PI for VTMP. It is proposed that Action 5 be initiated at the beginning of 2019 and completed in 2020.

Estimation of costs of actions and activities
The TAP is estimated at US$ 321,500 that will be funded through a combination of cash/grant (US$15,000 from government and US$287,000 from donors and development partners) and in-kind financing (US$19,500 from public institutions).

Action Plan for Electric Scooter (e-scooter)

Ambition and benefits
By 2030, there will be an additional 1,500 e-scooters on the roads.

The sustainable development benefits of the TAP are: (1) (1) direct GHG emission reductions in 2030 of ~744 tCO_2 per year; and (2) an avoided cost on energy bill in 2030 of ~US$ 154,500. Because of the small size of Seychelles, land is a valuable and expensive commodity. Another benefit of the technology is that it does not entail incremental land use compared to conventional cars.

Proposed Actions and timeline for implementation
Action 1: A subsidy on loan interest for e-scooters – The scheme will be set up early in the TAP implementation process (i.e. 2019) but its monitoring and review will probably span most of the target period – i.e. 2030;
Action 2: Establish authorised dealership for e-scooters – Since the urgency is only moderate, this action will be implemented in 2020; and
Action 3: Training of qualified technicians to carry out repairs and maintenance –The activities will be initiated in year 2 (2019), with accredited trainings delivered in 2020.

Estimation of costs of actions and activities
The incremental cost of the TAP is estimated at US$ 19,500 that will be funded through a combination of cash/grant (US$17,500 from donors and development partners) and in-kind financing (US$2,000 from public institutions).

PIs for Land Transport
1. *Project Idea 1 – Enabling conditions for promoting low-carbon vehicles:* The PI will cover hybrid and electric cars, and e-scooters. It aims to stimulate market demand for these mitigation technologies through financial incentives in the form of a subsidy on loan interest, which is then expected to create the pull for other market conditions, such as a regulatory framework for authorised dealers in low-carbon vehicles, and qualified technicians for carrying out maintenance and repairs. The PI is expected to cost US$54,500 over 2 years; and
2. *Project Idea 2 – Catalysing implementation of the VTMP:* The VTMP is a complex undertaking that involves a multitude of stakeholders. Its implementation, therefore, requires two conditions, namely that: (1) there is a high-level cross-sectoral stakeholders' coordination structure that allows all parties to participate in planning and implementation; and (2) the VTMP should be embedded in a national strategic plan, such as the Seychelles Strategic Plan (SSP) that guides the physical development in Seychelles. The PI is expected to cost US$232,000 over 2 years.

Chapter 1 Technology Action Plan and Project Ideas for the Power Sector

1.1. TAP for Power Sector

1.1.1. Sector Overview

The Seychelles relies almost entirely on imported fossil fuel for its energy needs and 98% of the imported energy is consumed in the power and transport sectors. This is also presented in the Second National Communication (SNC) as emissions results, the generation of public electricity and transport accounted for 82.0% and 82.8% of all emissions in 2000 and 2007, respectively (Government of Seychelles, 2011). The Seychelles prioritised the power sector for technical assistance under the Technology Needs Assessment (TNA) project as it is the highest GHG emitting sector in Seychelles (Government of Seychelles, 2017). The choice of this sector is aligned with the Seychelles Nationally Determined Contributions (NDC) that has been submitted to the UNFCCC (Government of Seychelles, 2015).

The Energy Policy of Seychelles 2010-2030 (Government of Seychelles, 2010) recommends increased energy efficiency (EE) and increasing contribution from renewable energy (RE) in the energy matrix. The targets of renewable energy contribution are 5% in 2020 and 15% in 2030. The energy base will be diversified and in the long term, energy supply is forecasted to be 100% based on RE.

Emissions scenarios were developed for all sectors under the SNC. The baseline scenario for the generation of public electricity reported in the SNC assumed an exponential growth of electricity demand as the economy would grow at a rate of 2.6% per annum. The projected change in CO_2 emissions assuming a status quo in technology usage is shown in **Table 1**. The table also shows the results from analysis carried out during the formulation of the Seychelles Nationally Determined Contribution (NDC).

Table 1. Projected CO_2 emissions from electricity generation.

Year	2006	2010	2015	2020	2025	2030
CO_2 (tonne) - SNC	172,655	203,851	258,045	332,355	431,996	564,226
CO2 (tonne) - INDC	not calculated	204,040	279,410	330,250	385,710	454,400

Source: Government of Seychelles, 2011 and MWH and Expertise France, 2015

Nine short-listed technologies were prioritised using multi-criteria analysis (Government of Seychelles, 2017a). Three technologies were prioritised for detailed barriers and enabling framework analysis, and for subsequently developing technology action plans (TAPs) (Government of Seychelles, 2017b) as follows:

1. **Waste heat recovery at Roche Caiman thermal power plant for electricity generation:** The Public Utilities Corporation (PUC) has experience with the recovery of waste heat for pre-heating HFO used in thermal power generation. This experience will be extended to the recovery of waste heat during combustion of fuel oil for power generation using steam cycle generation. The target is to produce 12MW of thermal energy using steam cycle generation from waste heat recovery by 2030 with the intermediary target of 5MW generation in 2020. Waste heat recovery at thermal power plants is not a prevailing practice in Seychelles.

2. **Waste-to-energy:** Centralised anaerobic digestion technology was chosen to be built very close to the current landfill. GHG emission reduction will accrue from landfill waste diversion and savings on grid electricity generated using fuel oil. The technology is not in place yet, and the target is to generate 4MW of grid-fed power from centralised anaerobic digestion of landfill waste by 2019.

3. **Biomass for power generation:**[1] According to available data, there should be sufficient biomass for base load power generation. There is also potential for generating electricity from agricultural residues, and agro-forestry products or energy crops. The target is to generate 5 MW of baseload power using biomass products in 2025. This technology is not yet in place in Seychelles.

Centralised utility-scale PV (with battery storage) was prioritised ahead of ago-forestry for power generation. Since the former was already the subject of attention for a funding proposal under the Green Climate Fund (GCF), it was not retained for further analyses. It is pointed out that the GCF project proposal was initiated after completion of the TNA Report.

1.1.2. Action Plan for Waste Heat Recovery at Roche Caiman power station

1.1.2.1 Introduction

Waste heat recovery is an innovative way of generating additional power at existing thermal generators by recovering waste heat in the exhaust gases to drive another generator. The waste heat can also be utilised to heat water for desalination or to produce ice directly. However, the electricity produced from this technology could be used in a wider range of activities and does not have to be consumed close to the source of generation. Recovering waste heat using compact heat exchangers is an effective way to increase energy efficiency in both new and existing plants. The viability of waste heat recovery for power generation is determined by the possibilities of reusing the energy in an economical way.

At the main power station on Mahé, heavy fuel oil (HFO) is burned in generators to produce electricity. In this process, heat is generated and discarded through chimney stacks into the atmosphere. Waste Heat to Power (WHP) harnesses the exhaust waste heat and uses it to drive a steam turbine generator to produce electricity. The exhaust gases are then released to the atmosphere at a lower temperature. The technology offers numerous advantages over the other power sector mitigation technologies analysed in the TNA project, such as (Government of Seychelles, 2017a, 2017b): (1) cumulative direct GHG emission reductions in 2030 of ~361 $ktCO_2$ per year; (2) creation of 55 direct green jobs; and (3) a cumulative avoided cost on energy bill to 2030 of ~US$ 80 million. Because of the small size of Seychelles, land is a valuable and expensive commodity. Another benefit of the technology is its relatively small land surface area requirement that has been estimated at ~0.1 ha. Finally, the technology has political support within the Public Utilities Corporation (PUC) that will implement the mitigation technology. **Annex 1** lists the stakeholders who provided expert information on the mitigation technology.

1.1.2.2 Ambition for the TAP

As mentioned earlier, WHP is not yet implemented in Seychelles. With the current capacity of the Roche Caiman power station, the estimated power production capacity using WHP is 12 MW. The sustainable development benefits discussed in section 1.1.1.1 correspond to the 12 MW target. Because of its novelty, the technology is planned to be implemented in two stages, namely with a first stage of 5 MW implemented in 2020, and an additional 7 MW implemented in 2028. The target was estimated based on an annual growth in power demand of 5%. The relatively high level of ambition underlying the set target is seen when it is compared to the total installed capacity at the Power Station C (Roche Caiman) of 76 MW, and with peak demand reaching 56 MW.

1.1.2.3 Actions and Activities selected for inclusion in the TAP

This section provides a discussion of the Actions and Activities that have been selected to inclusion in the TAP for waste heat recovery at Roche Caiman power station. The Actions are linked to the measures that were identified following detailed analyses of barriers facing the technology (Government of Seychelles, 2017b), as well as the enabling environment required to promote the technology. A

[1] In the TNA Report and the BAEF Report this technology was named 'agro-forestry'. Since the technology uses a combination of feedstocks for agro-forestry and agricultural residues, stakeholders have suggested the change of name to 'biomass'.

programmatic approach is used to justify the formulation of TAP. While the technology transfer will rest on the implementation of all Actions, Project Ideas have been proposed to start the technology transfer process by focusing on Actions and Activities of immediate urgency and those presenting low-hanging fruits. The Project Idea will focus on promoting an enabling environment that will be supportive of other mitigation technologies.

Summary of barriers and measures to overcome barriers

Table 2 provides a summary of the barriers and measures identified for waste heat recovery at Roche Caiman power station. They are derived from the TNA Barriers Analysis and Enabling Framework Report – Mitigation (Government of Seychelles, 2017b).

Table 2. Overview of barriers and measures to overcome these for Waste Heat Recovery.

Categories	Identified barriers	Measures to overcome barriers
Economic and financial	• High upfront capital cost • High cost of capital underpinned by risks arising from technology, institutional and human capacity barriers	• a government-guaranteed loan denominated in foreign currency (i.e. US$) at a fixed concessional interest rate of 2% per annum for a period of 15 years
Legal and regulatory	• Existing legislation prevents investments from independent power producers • The Seychelles Energy Commission (SEC), acting as regulator for the power sector, lacks the authority or capacity to adequately regulate the sector • Lack of standardised PPA and tendering process	• Updating the Energy Act 2012: (1) to define the power sector market activities and the roles of market actors; and (2) to give the SEC the powers it needs to regulate the entire electricity market sector • Accompanying institutional and human capacity strengthening for the SEC through a combination of trainings and exchanges with overseas energy sector regulators • Developing a standardised PPA and tendering process
Institutional and organisational capacity	Lack of dedicated project development, project implementation, and operation and maintenance (O&M) teams	Risk transfer through the use of a public-private partnership (PPP)
Human skills	Little domestic expertise to implement the technology	• Developing human capacity and expertise by providing appropriate training in the prioritised technology • Sponsoring selected management and technical staff (from PUC and SEC) on a study tour to learn more about the technology

Source: Government of Seychelles, 2017b

Actions selected for inclusion in the TAP (Waste Heat Recovery)

It is important at this juncture to explain the rationale that has been adopted for selecting meaures for inclusion in the TAP. The same approach has been used for all prioritised mitigation technologies in Seychelles. First, it is pointed out that the barriers analyses that have been carried out in the TNA project were used to identify the basket of measures that need to be implemented in synergy in order to promote technology transfer and diffusion – i.e. the targets for technology implementation are predicated on the assumption that all the measures will be implemented simultaneously. Second, this rationale pervaded the benefit-cost analyses that have been carried out (Government of Seychelles, 2017b). The effectiveness and cost efficiency of the contribution of each measure to achieve part of the technology penetration target to 2030 have not been investigated in the global TNA project. Hence, it is not meaningful to implement any measure in isolation to others. Consequently, all the identified measures are ranked as medium to high in terms of urgency. A note is provided where a measure is already being covered by an existing initiative.

Table 3 provides an assessment of the measures considered for inclusion in the TAP for Waste Heat Recovery. Hence, all the measures discussed in **Table 3** have been retained as Actions for the Waste Heat Recovery TAP. The measures are grouped by category of barriers.

Table 3. Assessment of measures for Waste Heat Recovery.

Measures to overcome barriers	Assessment	Ranking
Financial & Economic Barriers Provision of a government-guaranteed loan denominated in foreign currency (i.e. US$) at a fixed concessional interest rate of 2% per annum for a period of 15 years	Economic and financial risks need to be reduced. While this can take place partially by alleviating non-financial risks (arising from non-financial barriers), it is crucial to reduce financial risks by making available lower cost of capital that is amortised over a long term. There is currently no plan to make available low-cost capital for waste heat recovery. Even in the presence of the most conducive enabling framework, the economic and financial barriers will halt technology implementation. This shows the very high importance of the proposed measures. Nevertheless, the financial measures will benefit from the existence of an enabling environment to promote private sector investments in the power sector (as discussed next in this table).	high
Legal and Regulatory Barriers Updating the Energy Act 2012	The Energy Act was recently established and there is no immediate plan to update it in order to allow private operators in the power sector. Nor is it contemplated to enhance the institutional capabilities of the energy regulator. So, in the absence of the proposed measures, the status quo will be maintained – i.e. the incumbent (PUC) will continue its monopolistic role in power generation, transmission, supply and sales. In the absence of the measure, it is anticipated that PUC will implement the technology on its own. One of the results will be that PUC will be exposed to risks (e.g. technology implementation, operation and maintenance with no in-house technical expertise) that could otherwise be transferred to a private partner that has all the necessary credentials and proposed technology references. The proposed measure to deregulate the power market will also require the setting up of a transparent tendering process and procedures (e.g. standardised PPA). This measure is seen as critical for enhancing the power sector enabling framework, implying that it should be considered as a first step for intervention. This measure can also play a catalytic role for the uptake of other mitigation technologies in the power sector.	high
Institutional & Organisational Barriers Improving institutional and organisational capacity	This is partly enabled by updating the Energy Act 2012 in order to allow private investors in the power market. As mentioned above, the use of the PPP modality can be a useful risk transfer mechanism for the PUC. Strengthening the institutional capacity of SEC is a critical element for promoting more transparency in the power market, and is considered as a measure that will also support the uptake of other mitigation technologies.	high
Human Capacity Barrier Improving human skills	By promoting the use of the PPP modality, the immediate need for PUC to train its personnel in waste heat recovery implementation, operation and maintenance is avoided. Nevertheless, it is important that staffs of PUC and SEC are completely dependent on external partners for making decision regarding the technology at the design and technology pre-selection stages. Even when the PPP modality is favoured, there is still the need for improving human skills on the technology in Seychelles.	Medium

Source: TNA project

Activities identified for implementation of selected Actions

Three Actions (based on the measures identified in **Table 3**) have been retained for inclusion in the TAP for waste heat recovery, and their accompanying activities are listed in **Table 4**.

Table 4. Summary of Actions for Waste Heat Recovery TAP and their corresponding Activities.

Summary of Actions	
Action 1:	**Government guaranteed loan denominated in foreign exchange (interest rate of 2% and term of 15 years)**
Action 2:	**Updating the Energy Act 2012 to allow private participation in the power market**
Action 3:	**Institutional strengthening**
Action 4:	**Skills enhancement in waste heat recovery at PUC and SEC (to be developed through the PPP or IPP setup)**
Activities for Action implementation	
Action 1: Government guaranteed loan denominated in foreign exchange with an interest of 2% and term of 15 years	
Activity 1.1	Appoint a Transaction Adviser for carrying out all activities under Action 1. The TA will be recruited by the SEC.
Activity 1.2	Identify the possible financial institutions
Activity 1.3	Carry out project feasibility studies for implementation waste heat recovery at Roche Caiman power station. This will be carried out by a Transaction Adviser.
Activity 1.4	Invite short-listed financial institutions to a workshop to present the project
Activity 1.5	Prepare short list of financial institutions with good financing packages
Activity 1.6	Prepare and issue tender dossier for short-listed institutions
Activity 1.7	Finalise approval of concessional loan
Action 2: Updating the Energy Act 2012 to allow private participation in the power market	
Activity 2.1	Update the Energy Act 2012 to reflect the country's policy and to define the legal framework for private sector participation in power generation. The legal framework should also propose Feed in Tariffs (for small scale renewables) and price benchmarks for utility-scale generation
Activity 2.2	Hold consultation with private companies to explain the process clearly
Activity 2.3	Initiative transparent technology bidding process, including developing tendering documents (Expression of Interest and Request for Proposal), to attract qualified private partners
Activity 2.4	Reinforce Seychelles Chamber of Commerce and Industry (SCCI) to provide support in the power sector in order to enhance the technology market chain
Action 3: Institutional strengthening	
Activity 3.1	Create a dedicated unit within MEECC to deal with energy efficiency and renewable energy
Activity 3.2	Training for SEC staff to assume regulator role, including international study tours to learn from benchmarked energy regulators
Activity 3.3	Equip SEC with appropriate tools and software to deliver on duties, including capacity to model and implement pricing mechanisms / electricity tariffs
Activity 3.4	Set up support institutions such as an arbitration court to strengthen SEC in its role as regulator
Activity 3.5	Establishing transparent tendering procedures and standardised PPA documents in the power sector
Action 4: Skills enhancement in waste heat recovery at PUC	
Activity 4.1	Ensure that skills transfer is included in the tendering dossier for selecting the private partner that will support technology implementation
Activity 4.2	Set up partnership (through MoU) with local technical and vocational training school, namely the Seychelles Institute of Technology (SIT)
Activity 4.3	Training provided to selected PUC staff on O&M of waste heat recovery equipment

Source: TNA project

Actions to be selected as Project Ideas

While recognising that the totality of the Actions and Activities presented in **Table 4** need to be implemented to achieve the tehnology target, a Project Idea (PI) is proposed to kick-start the implementation of the TAP. The PI is composed of a combination of 'low-hanging fruits' and Activities that are of immediate urgency. Some Actions are also considered urgent because they provide an enbling environment supportive of the implementation of the other Actions/Activities, and that are also supportive of the uptake of other mitigation technologies in the power sector. Consequently, the following Actions/Activities are proposed as PI for waste heat recovery:

- Action 2 (all Activities): This Action is identified as the necressary first step to technology transfer in the power sector. The urgency of carrying out institutional and regulatory reforms in the power sector has been discussed in **Table 3**; and
- Action 1 (4 Activities): In parallel, the first four activities under Action 1 will be implemented in order to start the process of identifying potential sources of low-cost financing for implementing the technology. Since there is little technical expertise regarding the mitigation technology in Seychelles, the process of developing technical feasibility studies, technology specifications, and transaction procedures and materials will be carried out by a Transaction Adviser (TA).

1.1.2.4 Stakeholders and Timeline for implementation of TAP

This section identifies the stakeholders who will be responsible to implement the Actions, as well as a clear definition of their roles in the process. It also gives the sequence and timing of each Activity.

Overview of Stakeholders

The roles of the main stakeholders in the implementation of the TAP for Waste Heat Recovery are given in **Table** 5. The roles are attributed to specific Actions. The list also contains stakeholders whose identities are currently unknown – i.e. they will be recruited or appointed during TAP implementation, but whose roles are well defined. In these cases, and where possible and practicable, potential stakeholders are identified to guide further action.

Table 5. Roles of stakeholders involved in the implementation of the Waste Heat Recovery TAP.

Key Stakeholders	Role
Ministry of Environment, Energy and Climate Change (MEECC) (Actions 2 and 3)	The MEECC is the parent ministry in charge of formulating policies for the energy sector (including power sector), as well as overseeing the development of policy instruments such as legislation and institutional arrangements in order to implement the policies. The Principal Secretary of the Department of Energy and Climate Change at MEECC is also the chairperson of the Seychelles Energy Commission (SEC). The MEECC will be directly responsible for updating the Energy Act 2012 (Action 2), and it will support institutional strengthening of the regulator (Action 3). MEECC will also be a beneficiary of the TAP under Action 3 through the creation of a dedicated unit to deal with energy efficiency and renewable energy.
Seychelles Energy Commission (Actions 1 and 3)	As the Regulator for the energy sector, the SEC will be directly responsible for appointing and supervising the Transaction Adviser for carrying out the activities under Action 1. As a direct beneficiary, the SEC will receive institutional strengthening under Action 3.
Public Utilities Corporation (PUC) (Actions 1 and 4)	The PUC is the incumbent in the power market, and it owns and controls the operations at Roche Caiman power station. Consequently, the mitigation technology cannot be implemented without the participation of PUC. As discussed in the report on barriers analysis and enabling framework (Government of Seychelles, 2017b), the approach for private sector involvement in this project could be through a public-private partnership (PPP) where the private partner would form a strategic partnership with the PUC. In this regard, PUC will be the beneficiary of concessional loan (Action 1). It will also be consulted as a key stakeholder in the power sector for implementing the

Key Stakeholders	Role
	Activities under Action 2. Staff of PUC will also benefit from human capacity building under Action 4.
Ministry of Finance, Trade and Economic Planning (MFTEP) (Action 1)	MFTEC is the mandated public institutions to negotiate and contract government-guaranteed loans in Seychelles. Consequently, the ministry will be closely involved in all Activities pertaining to Action 1, especially regarding developing the terms of reference for the TA, coordinating potential financial institutions, and ensuring that the tender dossier and evaluation of bids by financial institutions is done correctly.
Seychelles Chamber of Commerce and Industry (SCCI) (Action 1 and 2)	Since the TAP is geared towards enhancing the participation of the private sector in the power market, and given that the deployment of any technology would be supported by putting in place an appropriate value chain, it is proposed that the SCCI[2] be involved under Actions 1 and 2. The SCCI does not have to be a project beneficiary, but a participant in working groups that will be established to implement the TAP. Further, it is necessary to include the umbrella body for the private sector in discussions related to updating the Energy Act 2012 to promote private participation in the power market.
Seychelles Institute of Technology (SIT)[3] (Action 4)	It was mentioned in the BAEF Report – Mitigation (Government of Seychelles, 2017b) that any accredited training related to human technical capacity building on the mitigation technologies proposed in the TNA project will be carried out by the SIT. The strategic private partner and PUC will work in collaboration with SIT to develop the necessary courses on waste heat recovery for power generation. Given that Seychelles is constrained by its limited pool of human capital (due to its very small population), it is proposed that any new training material be either incorporated into an existing course on power generation or industrial processes requiring heat and steam.
Transaction Adviser (TA) (Actions 1 and 2)	Since there is no technical capacity in Seychelles on waste heat recovery for power generation, it is most appropriate to appoint a TA that will have all the technical competencies (backed by solid project references) to support the Activities proposed under Action 1. The TA will also be responsible for developing the tendering documents for attracting the most qualified potential private partners (Activity 2.4).
Financial Institutions (bilateral and multilateral) (Action 1)	One of the main objectives of Action 1 is to identify the most suitable financial institution for the provision of concessional loans for investing in the mitigation technology. Examples of potential financial institutions are: multilateral (World Bank, African Development Bank or European Investment Bank) or bilateral (PROPARCO and KfW). Government to Government financing should also be prospected.
Strategic Private Partner (Actions 2 and 4)	The modality proposed for deploying waste heat recovery at Roche Caiman power station is through a strategic partnership between a private partner and the PUC. The private partner will bring technology expertise in terms of installation and commissioning of waste heat recovery and power generation units, and operation and maintenance (Action 2). The profile and expertise of the private partner will be thoroughly defined in tendering documents that will be developed by the TA. The strategic partner may also be implicated in the development and provision of training courses on the technology chain (Action 4).

Source: TNA project

[2] The SCCI is a registered association of businesses operating in Seychelles and is the most representative intermediary body of the private sector with a wide membership of some 220 members, which includes all the main economic operators in the country, as well as the main professional organisations and associations. Some of its aims are: to be the respected advisor to Government and Business on economic and fiscal policies and issues; to be an effective provider of services, support and assistance for the development of business and free enterprise; to defend business against discriminatory rules and regulations, and to be Champions of fair business practice (http://www.seychelles.travel/en/contacts/local-services/mah/seychelles-chamber-of-commerce-industry-scci - accessed 7 March 2018).

[3] The SIT is a technical and vocational education and training (TVET) institution established as a Professional Centre from January 2015 under the Tertiary Education Act (TEA) 2011. It operates under the aegis of the Ministry of Education. It is composed of several departments, including the department of Motor Vehicle Engineering, which provides training in maintenance, servicing and repairs of light vehicles. Please see: http://www.sit.sc/index.html - accessed 7 March 2018.

Scheduling and sequencing of specific activities

A detailed timetable for the activities can be found in the planning table below (**Table 6**). The TAP for waste heat recovery at Roche Caiman for power generation is planned for implementation over the period 2018-2021. However, for the actions envisioned under this TAP the sequencing would be approximately as follows:

Action 1: Government guaranteed loan denominated in foreign exchange – Urgent start in year 1 (2018) and completed by year 2 (2019);

Action 2: Updating the Energy Act 2012 to allow private participation in the power market – It is envisaged that this is vital for creating the enabling environment for promoting transfer of the mitigation technology. As explained above, this action will form part of the PI note, and consequently will need to be implemented upfront. Therefore, this action will be initaitied right away in year 1, with the legislation updates completed within the first 18 months of implementation start. It is also envisaged that the policy and accompanying legal and regulatory frameworks will be updated, if needed, in 2027;

Action 3: Institutional strengthening – The activities will be initiated in year 2 (2019), and overseas study tours for the SEC will be carried out every 3 years (i.e. 2019, 2022, 2025 and 2028). The institutional set ups will take place over a longer period of time, with the energy efficiency and renewable energy unit at MEECC being established in 2019-2020, and the arbitration court established in 2021;

Action 4: Skills enhancement in waste heat recovery at PUC and SEC – This Action will be synchronised with the period of installation and commissioning of the technology, which is expected to take place in 2019 (year 2) and 2020 (year 3).

1.1.2.5 Estimation of Resources Needed for Action and Activities

This section discusses the capacity building elements of the TAP, as well as an estimation of its implementation costs.

Estimation of capacity building needs

Capacity building is an element that cuts across all the Actions, and is justified from the perspective that human and institutional learning can take place at any moment during TAP implementation. Nevertheless, there are dedicated capacity building activities that underpin efforts to overcome human capacity and institutional barriers (**Table 2**). These are:

- Activity 2.4: Reinforce Seychelles Chamber of Commerce and Industry (SCCI) to provide support in the power sector in order to enhance the technology market chain;
- Activity 3.2: Training for SEC staff to assume regulator role, including international study tours to learn from benchmarked energy regulators;
- Activity 3.3: Equip SEC with appropriate tools and software to deliver on duties, including capacity to model and implement pricing mechanisms / electricity tariffs; and
- Activity 4.3: Training provided to selected PUC staff on O&M of waste heat recovery equipment

It is also pointed out that capacity needs during the planning and implementation stages of the TAP (**Table 6**) are often taken care of through the implementation of some of the Activities. For instance, the Transaction Adviser (TA) that will be the result of Activity 1.1 will provide technical expertise in carrying out techno-financial and economic analyses of the proposed mitigation technology and support institutional capacity building in tendering processes. Similarly, the strategic private entity that will be chosen to partner with PUC (Activity 2.3) will support the human capacity building of selected PUC staff on the installation, and O&M of the proposed mitigation technology.

Estimations of costs of actions and activities

The cost of each Activity constituting the TAP is provided in **Table 6**. The total cost is estimated at US$ 340,000 that will be funded through a combination of cash/grant and in-kind financing. The in-

kind financing is estimated at US$37,000 for Activities 4.2 and 4.3. Further, government is expected to contribute US$ 10,000 for implementing Activity 1.4 and Activity 2.2. The long-term contribution of government is expected to be higher through the staffing of the new energy efficiency and renewable energy unit in MEECC. The salary and administrative costs associated with this unit is not budgeted in the TAP, as it is proposed to be funded through the recurrent budget of MEECC (Activity 3.1). Therefore, US$ 293,000 is expected to be funded through the financial support of donors and development partners, including international climate finance sources.

It is pointed out that the estimated cost of the TAP for waste heat recovery at Roche Caiman power station for power generation include only the immediate costs associated with the plan given in **Table** 6. Consequently, it does not include: (1) activity costs that will accrue in the future such as for Activity 2.1 where it is proposed that a further US$ 30,000 will be needed for updating the energy policy and its related legislations in 2027; and (2) the cost of the government guaranteed loan to finance the mitigation technology. In carrying out the benefit cost analysis of waste heat recovery (Government of Seychelles, 2017b), the total capital cost for achieving a target of 12 MW installed capacity was estimated at US$ 36 million, while the cumulative cost of O&M in 2030 was estimated at US$ 6.84 million.

Table 6. Planning table - characterisation of activities for implementation of actions for Waste Heat Recovery.

Action 1:	**Government guaranteed loan denominated in foreign exchange**									
Activities	**Planning**				**Implementation**				**Costs and funding needs**	
	Start	Complete	Who	Capacity needs	Start	Complete	Who	Capacity needs	Costs (US$)	Who will fund
1.1 Appoint a Transaction Adviser (TA)	Q3-2018	Q3-2018	SEC (with support from MEECC)	Definition of Terms of Reference (ToR)	Q4-2018	Q4-2018	SEC	none	5,000	Government (SEC and MEECC) – in-kind contribution for existing staff time
1.2 Identify the possible source of financial institutions	Q4-2018	Q1-2019	MEECC and SEC	None (covered under definition of ToR)	Q2-2019	Q2-2019	Transaction Adviser (TA)	None	10,000	Donor / Development Partner
1.3 Carry out project feasibility studies	Q2-2019	Q2-2019	PUC and SEC (with support from MEECC)	None (covered under definition of ToR)	Q2-2019	Q3-2019	TA	None	125,000	Donor / Development Partner
1.4 Invite financial institutions to a workshop to present the TAP	Q3-2019	Q3-2019	TA	None	Q3-2019	Q3-2019	Ministry of Finance, Trade and Economic Planning (MFTEP), SEC, MEECC and PUC	None	5,000	Government (MFTED and SEC)
1.5 Prepare shortlist of financial institutions with good financing packages	Q3-2019	Q3-2019	TA	None	Q4-2019	Q4-2019	TA	None	5,000	Donor / Development Partner

1.6 Prepare and issue tender dossier for short-listed institutions	Q4-2019	Q4-2019	TA	None	Q4-2019	Q4-2019	Tender Board, MFTEP, SEC, TA	Development of Tender Dossier; Evaluation and Appraisal of bids (all provided by the TA)	15,000	Donor / Development Partner
1.7 Finalise bidding process to select debt provider	Q4-2019	Q4-2019	TA (with support from Tender Board, MFTEP)	None	Q1-2020	Q2-2020	TA (with support from Tender Board, MFTEP)	None	5,000	Donor / Development Partner
Action 2:	**Updating the Energy Act 2012 to allow private participation in the power market**									
Activities	**Planning**				**Implementation**				**Costs and funding needs**	
	Start	Complete	Who	Capacity needs	Start	Complete	Who	Capacity needs	Costs (US$)	Who will fund
2.1 Updating the Energy Act 2012	Q1-2019	Q1-2019	MEECC	Estimating human capacity and cost	Q1-2019	Q3-2019 (revision also planned in 2027)	MEECC (with inputs from external Services Providers)	Legal and regulatory frameworks for catalysing private investments in the power market (provided through contracting of external Services Providers)	30, 000 (2019) [*30,000 (2027)*]	Donor/development partner
2.2 Hold consultation with private companies to explain the process clearly	Q4-2019	Q4-2019	SEC, PUC (with support from SCCI and MEECC)	Technical requirements of waste heat recovery at Roche Caiman for power generation	Q4-2019	Q4-2019	SEC, PUC (with support from SCCI and MEECC)	Technical requirements of waste heat recovery at Roche Caiman for power generation (provided by TA through outputs of Activity1.3)	5,000	SEC, PUC

2.3 Initiate transparent technology bidding process to select PUC Strategic Partner	Q1-2020	Q1-2020	TA	None	Q2-2020	Q4-2020	Tender Board, TA, SEC	None	10,000	Donor / Development Partner
2.4 Reinforce SCCI to provide support in this sector	Q4-2019	Q4-2019	SCCI, SEC, TA	None	Q4-2019	Q1-2020	TA	Technology value chain (provided by TA)	5,000	Donor / Development Partner
Action 3:	**Institutional strengthening**									
Activities	**Planning**				**Implementation**				**Costs and funding needs**	
	Start	Complete	Who	Capacity needs	Start	Complete	Who	Capacity needs	Costs (US$)	Who will fund
3.1 Create a dedicated unit to deal with energy efficiency and renewable energy	Q2-2019	Q2-2019	MEECC	Skills to define the structure of unit and associated staff profile	Q3-2019	Q2-2020	Cabinet of Ministers, MEECC	Policy and policy instruments (public derisking instruments)	N/A	Recurrent budget of line ministry
3.2 Training for SEC staff to assume regulator role	Q1-2019	Q2-2019	SEC	Estimating human capacity gap and cost	Q3-2019	Q4-2019	SEC	Administration and operation of an independent energy regulator	8,000 (2019) [*8,000 in each of 2022, 2025 and 2028*]	Donor/development partner
3.3 Equip SEC with appropriate tools and software to deliver on duties	Q4-2019	Q1-2020	SEC	Estimating human capacity gap and cost	Q2-2020	Q2-2020	SEC (with inputs from external Services Providers)	Technical capacity for modelling tariffs and other financial/economic instruments for the power sector	15,000	Donor/development partner

3.4 Set up support institutions, such as Arbitration Court	Q4-2019	Q2-2020	MEECC, SEC, SCCI and Department of Legal Affairs	Institutional structure and mandate of Arbitration Court	Q3-2020	Q2-2021	MEECC, SEC, SCCI and Department of Legal Affairs (with inputs from external Services Providers)	High calibre human expertise	15,000 (does not cover the cost of staffing since this is expected to be covered through government recurrent budget)	Donor/development partner
3.5 Establishing transparent tendering procedures and standardised PPA documents	Q4-2019	Q1-2020	SEC, SCCI and Department of Legal Affairs (with technical input from TA)	Institutional structure and mandate of Arbitration Court	Q1-2020	Q2-2020	SEC, SCCI and Department of Legal Affairs (with technical input from TA)	Legal and procedural expertise (provided by TA)	15,000 (does not cover the cost of staffing since this is expected to be covered through government recurrent budget)	Donor/development partner
Action 4:	**Skills enhancement in waste heat recovery at PUC**									
Activities	**Planning**				**Implementation**				**Costs and funding needs**	
	Start	Complete	Who	Capacity needs	Start	Complete	Who	Capacity needs	Costs (US$)	Who will fund (Step 4.3)
4.1 Ensure that skills transfer is included in the tendering documents for selecting Strategic Private Partner	Q1-2020	Q1-2020	TA	None	Q2-2020	Q4-2020	Tender Board, TA, SEC	None	N/A (this is already covered under the budget for Activity 2.3)	Donor / Development Partner

4.2 Set up partnership (through MoU) with SIT	Q2-2019	Q2-2019	SIT, SEC, PUC, SCCI, MEECC and Ministry of Education	None (human capacity needs gap analysis will be informed by the work of the TA)	Q3-2019	Q3-2019	PUC, SIT and Ministry of Education	None	2,000	Government (in-kind)
4.3 Training provided to selected PUC staff on installation, and O&M of waste heat recovery equipment (this covers on-site training with collaboration of SIT, and overseas study tours)	Q3-2020	Q3-2020	SIT, PUC, Strategic Partner	Organisational skills	Q4-2020	Q2-2021	SIT, PUC and Strategic Partner	Technical expertise provided by the Strategic Partner	15,000 (2020, study tour) 50,000 (2020, onsite training; includes 15,000 for course development by SIT, and 35,000 in PUC staff time as in-kind contribution)	Donor/development partner Donor/development partner (PUC, in-kind contribution)

Source: TNA project

1.1.2.6 Management Planning

This section identifies the risks to successful implementation of the TAP for waste heat recovery at Roche Caiman power station for power generation. Measures to mitigate the risks are also identified. It also identifies the immediate critical steps that would be required to initiate TAP implementation.

Risks and Contingency Planning

Table 7 provides an overview of the main risks and contingency planning for the waste heat recovery TAP. The main categories of risks that have been identified are: financial, cost escalation, scheduling, and technology performance. Financial and technology performance risks have been evaluated as high, and hence will require most attention in TAP implementation.

Next steps

The immediate requirement to proceed with the implementation of the TAP and the proposed Project Idea (PI) is to obtain political support for the TAP. This can be secured through a two stage process, namely:

1. Cabinet approval: The MEECC, with the support of SEC and PUC, need to ensure that the validated TAP receives the approval of the Cabinet of Ministers. The Cabinet is the highest instance of decision making in government; and
2. TAP Steering Committee: The next logical step would be to put in place a Steering Committee (SC) that will oversee the execution of the TAP and PI. It is proposed that the members of the SC will be constituted by the stakeholders listed in **Table 5**. The SC may be presided by the MEECC with the SEC acting as co-chair.

There are four critical steps that need to be controlled in order to promote the uptake of waste heat recovery at Roche Caiman power station for electricity generation. As mentioned above, all of these critical steps relate to minimising financial and technology performance risks. The critical steps are also related to the fact that the uptake of waste heat recovery for power generation is premised on developing synergies between Actions – i.e. overcoming barriers and associated risks independently of each other will not lead to technology transfer. With these considerations in mind, the critical steps are:

- Appointment of Transaction Adviser: Since the technical and technology expertise does not exist in Seychelles, much of the techno-economic evaluations, as well as putting in place procedures and mechanisms to enhance the transparency of the bidding process will need to be carried out by a competent Transaction Adviser to be recruited by the SEC with support from MEECC. As shown in **Table 6**, the TA will carry out several activities that are core to the TAP. In other words, the implementation of the TAP requires the prior contracting of the TA;
- Conducive regulatory framework: The technology uptake also relies on PUC partnering with a strategic private enterprise that has all the technical and technology expertise on waste heat recovery for power generation. For this to happen, the Energy Act has to be updated to provide the necessary environment that will enable the participation of private enterprises in the power market;
- Choice of strategic partner: Financial and technology performance risks will be minimised by identifying and attracting a competent private partner that will bring all the necessary technical and technology expertise. The onus will rest on the TA to develop a tender dossier that will spell out all the necessary credentials that would be sought after; and
- Availability of low-cost capital: The successful transfer of the technology is premised on the availability of low-cost capital. Hence, the activities under Action 1 are critical to ensuring that the appropriate amount of capital is made available on attractive terms.

Table 7. Overview of risk categories and possible contingencies for waste heat recovery TAP.

Type of risk	Related to Action or Activity	Description of risk	Contingency actions	
1. Financial risk	Action 1	Lack of financing is one of the most significant barriers that the technology uptake faces. Even of all other barriers are eliminated, lack of low-cost financing will still prevent technology uptake. The probability of this risk is low, but its impact is high. Consequently, the risk is high.	***Time interval for M&E:***	Annual
			M&E responsibility:	Ministry of Finance, Trade and Economic Planning
			Contingency measures needed:	The TAP has been designed to minimise the likelihood that adequate financing will not be achieved, through the design of the Activities under Action 1. The contingency plan is composed of a basket of measures such as the use of a Transaction Adviser to guide the process, establishing the appropriate enabling environment, and the selection of an appropriate Strategic Partner that will bring all the required technical and technology expertise to work with PUC.
			Responsibility contingency measure:	SEC and MEECC
			Timing contingency measure:	Aligned with the action/activity plan shown in **Table 6**.
2. Cost escalation risk	Actions during the implementation phase	As main components for the projects are manufactured outside the country, the time the activity is thought of in the TAP and the time it is implemented, the cost of the equipment may have changed significantly. The probability of this risk is low, and its impact is medium. Consequently, the risk is low-to-medium.	***Time interval for M&E:***	Annually
			M&E responsibility:	SEC and MEECC
			Contingency measures needed:	The timeline for implementing activities need to be followed closely. The technology costs (capital investment and O&M) will be ascertained through the detailed techno-economic study that will be carried out by the Transaction Adviser (Activity 1.3). The results of the study will inform negotiations with the most appropriate financial institution. The choice of a Strategic Partner will also serve as a means to contain technology costs.

			Responsibility contingency measure:	MFTEP, PUC and SEC
			Timing contingency measure:	First 3 years of TAP implementation
3. Scheduling risk	All types of activities	An activity takes longer to complete than originally planned. The probability of this risk is low, and its impact is low. Consequently, the risk is low.	***Time interval for M&E:***	6 monthly
			M&E responsibility:	SEC, MEECC, MFTEP and PUC
			Contingency measures needed:	The planning given in **Table 6** has made allowance for Activity schedule slippage. Identification of critical path items, whose delay stalls all progress as discussed in the next section.
			Responsibility contingency measure:	SEC and MEECC
			Timing contingency measure:	lifetime of TAP
4. Performance risk	actions during the technology implementation phase	The waste heat recovery system does not produce as much energy as anticipated. The probability of this risk is low, but its impact is high. Consequently, the risk is high.	***Time interval for M&E:***	Annually
			M&E responsibility:	SEC and MEECC
			Contingency measures needed:	Technology performance will be ascertained early on in the TAP implementation through the detailed feasibility study that will be carried out by a competent Transaction Adviser (Activity 1.3). Technology performance will also be ensured using the sound technical and technology expertise of the Strategic Partner that will be identified under Action 2.
			Responsibility contingency measure:	Transaction Adviser and PUC
			Timing contingency measure:	Every quarter (but also aligned with the timeline for Activity 1.3 and 2.3).

Source: TNA project

1.1.2.7 TAP overview table – Waste Heat Recovery at Roche Caiman Power Station for Power Generation

The overview of the TAP for waste heat recovery at Roche Caiman power station for electricity generation is given in **Table 8**.

Table 8. TAP overview table for Waste Heat Recovery at Roche Caiman power station.

Sector	**Energy**							
Sub-sector	Power generation							
Technology	Waste Heat Recovery at Roche Caiman power station for power generation							
Ambition	A total capacity of 12 MW will be installed in two stages: 5 MW in 2020 and an additional 7 MW in 2028. The relatively high level of ambition underlying the set target is seen when it is compared to the total installed capacity at the Power Station C (Roche Caiman) of 76 MW, and with peak demand reaching 56 MW.							
Benefits	The sustainable development benefits of the TAP are: (1) cumulative direct GHG emission reductions in 2030 of ~361 $ktCO_2$ per year; (2) creation of 55 direct green jobs; and (3) a cumulative avoided cost on energy bill to 2030 of ~US$ 80 million. Another benefit of the technology is its relatively small land surface area requirement that has been estimated at ~0.1 ha.							
Action	**Activities to be implemented**	**Sources of funding**	**Responsible body and focal point**	**Time frame**	**Risks**	**Success criteria**	**Indicators for Monitoring of implementation**	**Budget per activity**
Action 1: Government guaranteed loan denominated in foreign exchange	Activity 1.1: Appoint a Transaction Adviser	Government (SEC and MEECC) – in-kind contribution for existing staff time	SEC	Q3-2018 to Q4-2018	Competent TA will not be attracted	TA with adequate credentials and project references recruited	Appointment of TA	5,000
	Activity 1.2: Identify the possible financial institutions	Donor / Development Partner	Transaction Adviser (TA) [Focal pt: MFTEP]	Q4-2018 to Q1-2019		List of potential financial institutions developed	Number of potential financial institutions with necessary credentials	10,000
	Activity 1.3: Carry out techno-economic feasibility studies	Donor / Development Partner	TA [Focal pt: SEC]	Q2-2019 to Q3-2019	Poor quality of studies because competent TA could not be attracted	High quality techno-economic feasibility study completed and approved by SC	Number and quality of studies published	125,000
	Activity 1.4: Outreach to potential financial institutions	Government (MFTED and SEC)	MFTEP [Focal pt: MFTEP]	Q3-2019	Limited response from potential financial institutions	Potential Financial institutions contacted with positive response	Number of financial institutions contacted	5,000
	Activity 1.5: Prepare short-list of financial institutions with attractive packages	Donor / Development Partner	TA [Focal pt: MFTEP]	Q3-2019 to Q4 2019		Adequate number of respected Financial Institutions with	Number of financial institutions on short list	5,000

						attractive packages are identified on competitive basis		
	Activity 1.6: Prepare and issue tender document for short-listed financial institutions	Donor / Development Partner	TA [Focal pt: Tender Board]	Q4 2019	Poor quality of tender document	Tendering document issued with clear tendering process outlined and financial institution selected in Q2 2020	- Tendering document developed and approved - Number of responsive financial institutions	15,000
	Activity 1.7: Finalise approval of loan	Donor / Development Partner	MFTEP	Q4-2019 to Q2-2020	Loan cannot be secured because of: (i) lack of interest in supporting technology; and/or (ii) terms of loan are not attractive to promote technology	~US$ 36 million secured for implementation of 12 MW installed capacity (final amount will be validated through Activity 1.3)	- Selection of final bidder - Amount and terms of loan secured	5,000
Action 2: Updating the Energy Act 2012	Activity 2.1: Update the Energy Act 2012	Donor/ Development partner	MEECC	Q1-2019 to Q3-2019	Resistance to opening the power market to private actors	Energy Act is updated with provision for private sector participation in the power market and feed-in tariffs for renewable energies are scheduled	Energy Act updated	30, 000 (2019) [*30,000 (2027)*]
	Activity 2.2: Consultation with private companies	SEC, PUC	SEC and SCCI [Focal pt: MEECC]	Q4-2019	Lack of interest from private companies	At least 5 local private companies showing interest in technology value chain after	Number of private companies consulted	5,000

						participating in outreach activities		
	Activity 2.3: Initiative transparent technology bidding process	Donor / Development Partner	TA and SEC [Focal pt: Tender Board]	Q1-2020 to Q4-2020	Low institutional capacity for implementing bidding process	Bidding process has been completed with the selection of private partner for the implementation of 5 MW of waste heat recovery by 2021	- Transparent bidding process in place and put into use - Number of responsive bids from potential strategic partners	10,000
	Activity 2.4: Reinforce Seychelles Chamber of Commerce and Industry	Donor / Development Partner	TA, SEC and MEECC [Focal pt: SEC]	Q4-2019 to Q1-2020	Lack of interest and capacity from SCCI	SCCI is fully informed about the potential market development in mitigation technology, and its members have responded positively to Activity 2.2	Number of SSCI members and staff capacitated	5,000
Action 3: Institutional strengthening	Activity 3.1: Create a dedicated unit within MEECC to deal with energy efficiency and renewable energy	Recurrent budget of line ministry	Cabinet of Ministers [Focal pt: MEECC]	Q2-2019 to Q2-2020	Lack of public financing prevents setting up of unit	A functional unit is established by Q2-2020 and providing policy support for the promotion of energy efficiency and renewable energy in Seychelles	Unit established and functional	N/A
	Activity 3.2: Training for SEC staff to assume regulator role	Donor/ Development partner	SEC	Q1-2019 to Q4-2019	Lack of absorption capacity of SEC	2 SEC staff participated in study tours and enhancing SEC institutional capacity	Number of SEC staff trained and supporting TAP implementation	8,000 (2019) [*8,000 in each of 2022, 2025 and 2028*]

	Activity 3.3: Equip SEC with appropriate tools	Donor/ Development partner	SEC	Q4-2019 to Q2-2020	Lack of absorption capacity of SEC	Tools deployed and SEC staff is capable of setting cost reflective electricity tariffs and to establish the renewable energy absorption capacity of the grid	- Number of tools deployed - Number of staff able to use tools productively for decision making	15,000
	Activity 3.4: Set up support institutions such as an arbitration court	Donor/ Development partner	MEECC and SEC [Focal pt: Department of Legal Affairs]	Q4-2019 to Q2-2021	Lack of political support for setting up court	Arbitration Court is set up and operational by Q2-2021	Arbitration Court established	15,000 (does not cover the cost of staffing since this is expected to be covered through government recurrent budget)
	Activity 3.5: Establishing transparent tendering procedures and standardised PPA documents	Donor/ Development partner	SEC [Focal pt: Department of Legal Affairs]	Q4-2019 to Q2-2020	Resistance to establish a transparent tendering process	Tendering process has been established and used to select most appropriate strategic private partner by Q2-2020	- Number of procedures and standardised documents developed - Number of private bidders that have used the tendering process - Feedback from bidders regarding the bidding process	15,000
Action 4: Skills enhancement in waste heat recovery	Activity 4.1: Ensure that skills transfer is included in tendering dossier	Donor / Development Partner	TA and SEC [Focal pt: Tender Board]	Q1-2020 to Q4-2020		Tendering dossier includes articles for skills transfer to PUC and other local institutions by the successful Strategic Partner	Tendering dossier with necessary articles on skills transfer developed	N/A (this is already covered under the budget for Activity 2.3)

	Activity 4.2: Set up partnership with SIT	Government (in-kind)	SIT and PUC [Focal pt: Ministry of Education]	Q2-2019 to Q3-2019	Low interest from SIT to develop course	MOU signed between SIT and PUC, and training course is developed	- Number of MOU signed - Number of courses developed - Number of participants in courses developed	2,000
	Activity 4.3: Provide training to selected PUC staff	Donor/ Development partner Donor/ Development partner (PUC, in-kind contribution)	SIT, PUC and Strategic Partner [Focal pt: SIT]	Q3-2020 to Q2-2021	Lack of interest from staff	4 selected PUC staff fully trained in the O&M of technology after participating in overseas study tour and training provided by SIT (with inputs from the Strategic Partner)	Number of PUC staff who have benefitted from study tours and training provided by SIT	15,000 (2020, study tour) 50,000 (2020, onsite training; includes 15,000 for course development by SIT, and 35,000 in PUC staff time as in-kind contribution)

Source: TNA project

1.1.3 Action Plan for Waste to Energy project

1.1.3.1 Introduction

This technology seeks to produce electricity from municipal solid waste (MSW) using centralised anaerobic digestion. The process of anaerobic digestion is decomposition of biodegradable material by micro-organisms in the absence of oxygen. This process is often used for industrial or domestic purposes to manage waste streams. As a result, the process produces a biogas, consisting mainly of methane (CH_4) and carbon dioxide (CO_2), which can be used for energy production in a Combined Heat and Power plant. Second, the process results in a nutrient-rich digestate which is similar to compost, and hence can be reused as a soil conditioner and nutrient enhancer.

The compaction and burial of trash at landfill facilities creates an anaerobic environment for decomposition. As a result, landfills naturally produce large amounts of methane. Gas emitted from the landfill facilities is typically called landfill gas, as opposed to biogas. The primary difference between the two is the lower methane content of landfill gas relative to biogas – approximately 45-60 percent compared to 55-70 percent. The use of centralised anaerobic digestion will seek to enhance the productivity of methane production.

1.1.3.2 Ambition for the TAP

The target is to generate 4 MW of grid-fed power from centralised anaerobic digestion of landfill waste by 2020. The importance of this project is not only to produce electricity, but also to address the issue waste volume reduction in order to prolong the lifetime of the existing landfill thereby reducing the need on additional landfill area. As discussed in the TNA Report (Government of Seychelles, 2017a), development in Seychelles is constrained by its very small land surface area.

1.1.3.3 Actions and Activities selected for inclusion in the TAP

The action plan follows the same approach that has been outlined in section 1.1.2.3. The Actions are linked to the measures that were identified following detailed analyses of barriers facing the technology (Government of Seychelles, 2017b), as well as the anabling environment required to promote the technology. The Project Idea will focus on promoting an enabling environment that will be supportive of other mitigation technologies, such as putting in place the appropriate legal and regulatory frameworks, and to cash on low-hanging fruits wins for promoting the mitigation technology.

Summary of barriers and measures to overcome barriers

A summary of the barriers and measures identified for waste to energy is given in **Table 9**. They are derived from the TNA Barriers Analysis and Enabling Framework Report – Mitigation (Government of Seychelles, 2017b). The legal and regulatory barriers are the same as those faced by waste heat recovery.

Table 9. Overview of barriers and measures to overcome these for Waste to Energy.

Categories	Identified barriers	Measures to overcome barriers
Economic and financial	Lack of financial incentive to make technology financially attractive and provide investment visibility	A tariff incentive is set at 0.88% of the marginal cost of production using fuel oil
Legal and regulatory	• Existing legislation prevents investments from independent power producers • The Seychelles Energy Commission (SEC), acting as regulator for the power sector, lacks the authority or capacity to adequately regulate the sector • Lack of standardised PPA and tendering process	• Updating the Energy Act 2012: (1) to define the power sector market activities and the roles of market actors; and (2) to give the SEC the powers it needs to regulate the entire electricity market sector • Accompanying institutional and human capacity strengthening for the SEC through a combination of trainings and exchanges with overseas energy sector regulators • Developing a standardised PPA and tendering process
Institutional and organisational capacity	Lack of coordination and synergy between stakeholders	Carrying out a detailed institutional review of all the relevant institutions, and formulating clear guidelines for institutional roles and responsibilities according to institutional mandates
Human skills	Little domestic expertise to implement the technology	Developing human capacity and expertise by providing appropriate training in waste to energy
Technical	Lack of detailed solid waste characterisation data	Carrying out a detailed solid waste characterisation on the three main populated islands of Seychelles

Source: TNA project

Actions selected for inclusion in the TAP (Waste to Energy)

The rationale that has been used for selecting measures for inclusion in the TAP was explained in section 1.1.2. The bottom line is that all the measures identified in **Table 9** need to be implemented in order to achieve the target of 4 MW installed capacity – i.e. it will not be meaningful to implement any measure in isolation to others. Consequently, all the identified measures are ranked as medium to high in terms of urgency.

An assessment of the urgency of measures considered for inclusion in the TAP for Waste to Energy is given in **Table 10**. As discussed above, the measures are based on the problem/objective trees from the BAEF and have already been identified as critical for inclusion in the TAP (Republic of Seychelles,

2017b). Hence, all the measures discussed in **Table 9** have been retained as Actions for the Waste to Energy TAP. The measures are grouped by category of barriers.

Table 10. Assessment of measures for Waste to Energy.

Measures to overcome barriers	Assessment	Ranking
Financial & Economic Barriers Provision of a financial incentive in the form of a feed-in-tariff that is set at 0.88% of the marginal cost of production using fuel oil	One of the main risks faced by potential investors is the inability to have market visibility and technology viability in the absence of a sound financial model to justify the upfront high capital investments. There is currently no set incentive for mitigation technologies of national interest but with limited scope for scaling up such as centralised AD (because of the finite amount of MSW that is available). Even in the presence of the most conducive enabling framework, the economic and financial barriers will halt technology implementation because investors are not able to carry out detailed financial modelling to justify investments. In the particular case of waste to energy wherein power generation is constrained by the availability for a fixed amount of MSW, it might be best to incentivise the uptake of the technology by providing a FiT. The financial measures will benefit from the existence of an enabling environment to promote private sector investments in the power sector (as discussed next in this table).	high
Legal and Regulatory Barriers Updating the Energy Act 2012	The Energy Act was recently established and there is no immediate plan to update it in order to allow private operators in the power sector. Nor is it contemplated to enhance the institutional capabilities of the energy regulator. So, in the absence of the proposed measures, the status quo will be maintained and the uptake of the technology will either not take place or be delayed. The government has voiced in favour of technology implementation by a private investor (Government of Seychelles, 2017b). However, the current legal framework prohibits private sector involvement in the power market. For the technology to be implemented, the legislation governing the power sector will have to be changed accordingly. The proposed measure to deregulate the power market will also require the setting up of a transparent tendering process and procedures (e.g. standardised PPA). This measure is seen as critical for enhancing the power sector enabling framework, implying that it should be considered as a first step for intervention.	high
Institutional & Organisational Barriers Improving institutional and organisational capacity	The generation of power from municipal solid waste is a cross-sectoral issue. One that requires close coordination between different line ministries (e.g. Ministry of Environment, Energy and Climate Change, Ministry of Finance, Trade and the Economic Planning, Ministry of Land Use and Habitat) and other stakeholders (e.g. PUC, Seychelles Energy Commission, local communities). The efficient and effective design, conceptualisation and implementation of the mitigation technology will require close coordination between all these stakeholders. Currently, one significant barrier facing the technology is insufficient coordination between relevant ministries and stakeholders. This can be as simple as the sharing of data to draw up	high

Measures to overcome barriers	Assessment	Ranking
	projects or the alignment of strategies for the sustainable management of solid waste in Seychelles. There is also low institutional capacity for putting in place a transparent tendering process, including a recourse mechanism for addressing any grievances of bidders.	
Human Capacity Barrier Improving human skills	One of the issues with the technology is the availability of human skills to develop and implement the technology, and, above all, to provide the necessary after sales service and maintenance support. This barrier can be circumvented by opening the tendering process to pre-qualified bidders that will have the onus to also build local capacity. Hence, the issue of lack of local human expertise is not as a significant barrier as the other barriers discussed in this table.	Medium
Technical Barrier Improving MSW data quality to inform technology feasibility and viability	There are still data gaps concerning the characterisation of MSW – i.e. the accurate breakdown of waste collected on the islands of Mahé, Praslin and La Digue by type and quantity. Although the quantity of waste on Praslin and La Digue may be small, it is important to understand whether this waste can be used for WTE on Mahé. As the AD process relies purely on biodegradable waste, the design of this system must take into account all the waste on the 3 main islands. The availability of quality and accurate data is vital to inform project feasibility.	High

Source: TNA project

Activities identified for implementation of selected Actions

Five Actions (based on the five measures identified in **Table 10**) have been retained for inclusion in the TAP for waste heat recovery, and their accompanying activities are listed in **Table 11**.

Table 11. Summary of Actions for Waste to Energy TAP and their corresponding Activities.

Summary of Actions	
Action 1:	**Set up appropriate FiT scheme**
Action 2:	**Updating the Energy Act 2012 to allow private participation in the power market**
Action 3:	**Institutional strengthening**
Action 4:	**Skills enhancement in waste to energy**
Action 5:	**Solid waste characterisation**
Activities for Action implementation	
Action 1: Set up appropriate FiT scheme	
Activity 1.1	Appoint an energy economist to develop FiT for waste to energy (and other renewables)
Activity 1.2	Develop model for setting tariffs
Activity 1.3	Set up system to monitor and update tariffs on a regular basis
Action 2: Updating the Energy Act 2012 to allow private participation in the power market	
Activity 2.1	Update the Energy Act 2012 to reflect the country's policy and to define the legal framework for private sector participation in power generation
Activity 2.2	Initiate transparent technology bidding process, including developing tendering documents (Expression of Interest and Request for Proposal), to attract qualified private partners
Action 3: Institutional strengthening	
Activity 3.1	Equip SEC with appropriate tools and software to deliver on duties, including capacity to model and implement pricing mechanisms / electricity tariffs
Activity 3.2	Set up support institutions such as an arbitration court to strengthen SEC in its role as regulator
Activity 3.3	Establishing transparent tendering procedures and standardised PPA documents in the power sector to attract private investor to implement waste to energy

Activity 3.4	Carry out detailed stakeholder mapping for all actors involved in waste to energy generation, and define roles and responsibilities
Activity 3.5	Set up a multi-stakeholder committee to enhance stakeholder coordination and provide oversight of technology implementation (based on the results of Activity 3.4)
Action 4: Skills enhancement in waste to energy	
Activity 4.1	Ensure that skills transfer is included in the tendering dossier for selecting the private partner that will support technology implementation
Activity 4.2	Set up partnership (through MoU) with local technical and vocational training school, namely the Seychelles Institute of Technology (SIT) for developing local technical expertise in waste to energy
Activity 4.3	Training provided to selected staff (e.g. SEC, MEECC) and technicians on waste to energy technologies
Action 5: Solid waste characterisation	
Activity 5.1	Draft and approve ToR for solid waste characterisation, and hire consultant to carry out characterisation
Activity 5.2	Carry out solid waste characterisation on Mahé, La Digue and Praslin, and produce final report

Source: TNA project

Actions to be selected as Project Ideas

While recognising that the totality of the Actions and Activities presented in **Table 11** need to be implemented to achieve the tehnology target, a Project Idea (PI) is proposed to kick-start the implementation of the TAP by focusing on 'low-hanging fruits' and Activities that are of immediate urgency. Some Actions are also considered urgent because they provide an enbling environment supportive of the implementation of the other Actions/Activities, and that are also supportive of the uptake of other mitigation technologies in the power sector. Consequently, the following Actions/Activities are proposed as PI for waste heat recovery:

- Action 1 (Activity 1.1 and Activity 1.2): Developing the FiT is an important first step towards providing long-term financial visibility to potential investors. Acivity 1.2 is related to Activity 3.1 that is discussed below;
- Action 2 (all Activities): This Action is identified as the necressary first step to technology transfer in the power sector. The urgency of carrying out institutional and regulatory reforms in the power sector has been discussed in **Table 10**;
- Action 3 (Activity 3.1): Developing a FiT has been identified as an enabler of the mitigation technology, and a 'low hanging fruit' would be to equip the SEC with the appropriate tools for developing pricing mechanisms and tariffs. Acitivity 3.1 is therefore proposed to be carried out in conjunction with Activity 1.2; and
- Action 5 (all Activities): In parallel, it is most important to carry out a full characterisation of municipal solid waste. The ensuing data will allow investors to develop their business model.

1.1.3.4 Stakeholders and Timeline for implementation of TAP

This section identifies the stakeholders who will be responsible to implement the Actions, as well as a clear definition of their roles in the process. It also gives the sequence and timing of each Activity.

Overview of Stakeholders

The roles of the main stakeholders for the implementation of the TAP for Waste to Energy are given in **Table 12**. The roles are attributed to specific Actions.

Table 12. Roles of stakeholders involved in the implementation of the Waste to Energy TAP.

Key Stakeholders	Role
Ministry of Environment, Energy and Climate Change (MEECC) (Actions 2, 3 and 5)	The MEECC is the parent ministry in charge of formulating policies for the energy sector (including power sector), as well as overseeing the development of policy instruments such as legislation and institutional arrangements in order to implement the policies. The MEECC is also responsible for developing and implementing all waste management policy and regulatory frameworks. The waste management and policy Section of

Key Stakeholders	Role
	the Environment Department is responsible for developing all policies regarding waste, waste collection, characterisation, treatment and disposal. This Section will be involved in coordinating the activities under Action 5. The Principal Secretary of the Department of Energy and Climate Change at MEECC is also the chairperson of the Seychelles Energy Commission (SEC). The MEECC will be directly responsible for updating the Energy Act 2012 (Action 2), and it will support institutional strengthening of the regulator (Action 3).
Landscape and Waste Management Agency (LWMA) (Action 3)	The LWMA responsible for the management of waste in Seychelles. It is responsible for waste collection, treatment, disposal and management. It manages the different contractors involved in waste and landfill management in Seychelles. Hence, it is anticipated that a contractual agreement for supplying solid waste to the private investor in centralised AD will involve the LWMA. Consequently, LWMA will be involved in Activities 3.3, 3.4 and 3.5.
Seychelles Energy Commission (Actions 1 and 3)	As the Regulator for the energy sector, the SEC will be directly responsible for developing the FiT proposed under Action 1. As a direct beneficiary, the SEC will receive institutional strengthening under Action 3.
Public Utilities Corporation (PUC) (Actions 1 and 2)	The PUC is the incumbent in the power market, and it owns and controls the national grid. The PUC will also be the off taker of electricity generated from centralised AD, and, consequently, will be involved in the development of FiT scheme. It will also be consulted as a key stakeholder in the power sector for implementing the Activities under Action 2.
Seychelles Institute of Technology (SIT) (Action 4)	It was mentioned in the BAEF Report – Mitigation (Government of Seychelles, 2017b) that any accredited training related to human technical capacity building on the mitigation technologies proposed in the TNA project will be carried out by the SIT. With the support of the private investor, the SIT will develop the necessary courses on waste to energy for power generation. Given that Seychelles is constrained by its limited pool of human capital (due to its very small population), it is proposed that any new training material be either incorporated into an existing course on power generation or industrial processes requiring heat and steam.

Source: TNA project

Scheduling and sequencing of specific activities

A detailed timetable for the activities can be found in the planning table below (**Table 13**). The TAP for waste to energy is planned for implementation between 2018-2023, and the sequencing would be approximately as follows:

Action 1: Set up appropriate FiT scheme – Urgent start in year 1 (Q4-2018) and completed in year 2 (Q2-2019);

Action 2: Updating the Energy Act 2012 to allow private participation in the power market – It is envisaged that this is vital for creating the enabling environment for promoting transfer of the mitigation technology (and the other mitigation technologies for the power sector). As explained above, this action will form part of the PI note, and consequently will need to be implemented upfront. Therefore, this action will be initiatied at the beginning of year 2 (Q1-2019), with the legislation updates completed within the first 9 months of implementation start. It is also envisaged that the policy and accompanying legal and regulatory frameworks will be updated, if needed, in 2027. The transparent technology bidding process will be carried in year 2;

Action 3: Institutional strengthening – The activities will be initiated in year 2 (2019), and activities such as the setting up of an Arbitration Court will take place in 2021;

Action 4: Skills enhancement in waste to energy – This Action will be synchronised with the period of installation and commissioning of the technology, which is expected to take place in 2021 (year 3). Preparation and planning will start in year 2 (2019); and

Action 5: Solid waste chatracterisation – The MEECC, with the support of LWMA, will take steps to carry out a detailed chatracterisation of municipal solid waste on the three populated island

of Seychelles. The characterisation will need to be completed over a 12 months period in order to account for seasonal trends in waste generation. This action will be carried out in 2019.

1.1.3.5 Estimation of Resources Needed for Action and Activities

This section discusses the capacity building elements of the TAP, as well as an estimation of its implementation costs.

Estimation of capacity building needs

Capacity building is an element that cuts across all the Actions, and is justified from the perspective that human and institutional learning will take place through the implementation of all activities constituting the TAP. Nevertheless, there are dedicated capacity building activities that underpin efforts to overcome human capacity and institutional barriers (**Table 9**). These are:

- Activity 3.1: Equip SEC with appropriate tools and software to deliver on duties, including capacity to model and implement pricing mechanisms / electricity tariffs; and
- Activity 4.3: Training provided to selected staff (e.g. SEC, MEECC) and technicians on waste to energy technologies.

It is also pointed out that capacity needs during the planning and implementation stages of the TAP (**Table 13**) are often taken care of through the implementation of some of the Activities. For instance, the private investor that will be chosen to implement waste to energy (Activity 3.3) will support SIT in developing necessary training courses on the proposed mitigation technology.

Estimations of costs of actions and activities

The cost of each Activity constituting the TAP is provided in **Table 13**. The total cost is estimated at US$ 391,000 that will be funded through a combination of cash/grant and in-kind financing. The in-kind financing is estimated at US$3,500 for Actvities 4.2 and 5.1. Further, government is expected to contribute US$ 57,500 for implementing Activity 1.1, Activity 2.4 and Activity 3.5. The long-term contribution of government is expected to be higher through the staffing of the proposed Arbitration Court. The salary and administrative costs associated with this unit is not budgeted in the TAP, as it is proposed to be funded through the recurrent budget. Therefore, US$ 330,000 is expected to be funded through the financial support of donors and development partners, including international climate finance sources.

It is pointed out that the estimated cost of the TAP for waste to energy includes only the immediate costs associated with the plan given in **Table 13**. Consequently, it does not include: (1) activity costs that will accrue in the future such as for Activity 2.1 where it is proposed that a further US$ 30,000 will be needed for updating the energy policy and its related legislations in 2027; and (2) the biennial update of tariffs between 2020 and 2030 that is expected to cost around US$ 20,000 per review. The technology costs related to capital investment and O&M are not part of the TAP since these will be born by the private investor against a return on investmnet that will be secured through the FiT proposed under Action 1. In carrying our the benefit cost analysis of waste heat recovery (Government of Seychelles, 2017b), the incremental cost of providing a FiT set at 0.88% of the marginal cost of production using fuel oil was estimated at US$ 0.91 million per year. Assuming that the technology will be implemented by the end of 2020, the cumulative cost of providing a FiT to 2030 is estimated at US$ 9.1 million.

Table 13. Planning table - characterisation of activities for implementation of actions for Waste to Energy.

Action 1:	**Set up appropriate FiT scheme**									
Activities	**Planning**				**Implementation**				**Costs and funding needs**	
	Start	Complete	Who	Capacity needs	Start	Complete	Who	Capacity needs	Costs (US$)	Who will fund
1.1 Appoint an energy economist to develop FiT for waste to energy (and other renewables)	Q4-2018	Q4-2018	SEC	Definition of Terms of Reference (ToR) for energy economist	Q1-2019	Q1-2019	SEC (with support from MEECC)	none	45,000	Government (through the SEC)
1.2 Develop model for setting tariffs (electricity and FiTs) with complete transfer of knowledge and expertise to SEC staff	Q1-2019	Q1-2019	SEC, MEECC and PUC	None (covered under definition of ToR)	Q1-2019	Q2-2019	Energy economist under supervision of SEC, and selected SEC staff	None (covered by technical inputs by Energy Economist)	50,000	Donor / Development Partner
1.3 Set up system to monitor and update tariffs (electricity and FiTs) on a regular basis	Q2-2019	Q2-2019	SEC, MEECC	None	2020	2030 (done periodically as determined by system to be established)	SEC, MEECC	Economic Analysis, and Measurement, Reporting and Verification (MRV) system	20,000 (per update) (it is assumed that the tariffs will be revised and updated, if necessary, every 2 years, implying a total budget of US$100,000 between 2020 and 2030)	Donor / Development Partner
Action 2:	**Updating the Energy Act 2012 to allow private participation in the power market**									

Activities	Planning				Implementation				Costs and funding needs	
	Start	Complete	Who	Capacity needs	Start	Complete	Who	Capacity needs	Costs (US$)	Who will fund
2.1 Updating the Energy Act 2012	Q1-2019	Q1-2019	MEECC	Estimating human capacity and cost	Q1-2019	Q3-2019 (revision also planned in 2027)	MEECC (with inputs from external Services Providers)	Legal and regulatory frameworks for catalysing private investments in the power market (provided through contracting of external Services Providers)	30, 000 (2019) [*30,000 (2027)*]	Donor/development partner
2.2 Initiate transparent technology bidding process to select qualified private partner	Q2-2019	Q2-2019	SEC	Technical expertise on bidding process	Q2-2019	Q4-2019	Tender Board, SEC, Services Providers (of technical assistance)	None	10,000	Donor / Development Partner
Action 3:	**Institutional strengthening**									
Activities	**Planning**				**Implementation**				**Costs and funding needs**	
	Start	Complete	Who	Capacity needs	Start	Complete	Who	Capacity needs	Costs (US$)	Who will fund
3.1 Equip SEC with appropriate tools and software to deliver on duties	Q1-2019	Q1-2019	SEC	Estimating human capacity gap and cost	Q1-2019	Q2-2019	SEC (with inputs from external Services Providers) - This is linked with Activity 1.2	Technical capacity for modelling tariffs and other financial/economic instruments for the power sector	15,000	Donor/development partner

3.2 Set up support institutions, such as Arbitration Court	Q4-2019	Q2-2020	MEECC, SEC and Department of Legal Affairs	Institutional structure and mandate of Arbitration Court	Q3-2020	Q2-2021	MEECC, SEC and Department of Legal Affairs (with inputs from external Services Providers)	High calibre human expertise	15,000 (does not cover the cost of staffing since this is expected to be covered through government recurrent budget)	Donor/development partner
3.3 Establishing transparent tendering procedures and standardised PPA documents	Q1-2019	Q1-2019	SEC and Tender Board (with technical input from Services Providers)	Technical content of tendering documents	Q1-2019	Q3-2019	SEC and Tender Board	Legal and procedural expertise (provided by Services Providers for Activity 2.1)	15,000	Donor/development partner
3.4 Carry out detailed stakeholder mapping for all actors involved in waste to energy generation, and define roles and responsibilities	Q1-2019	Q1-2019	MEECC	None	Q2-2019	Q2-2019	MEECC and SEC	None (institutional mapping expertise provided by Services Providers)	10,000	Government
3.5 Set up a multi-stakeholder committee to enhance stakeholder coordination and provide oversight of technology implementation	Q2-2019	Q2-2019	MEECC and SEC	None	Q3-2019	Q3-2019	MEECC and SEC	None	2,500	Government
Action 4:	**Skills enhancement in waste to energy**									
Activities	**Planning**				**Implementation**				**Costs and funding needs**	

	Start	Complete	Who	Capacity needs	Start	Complete	Who	Capacity needs	Costs (US$)	Who will fund (Step 4.3)
4.1 Ensure that skills transfer is included in the tendering documents for selecting the Private Partner	Q1-2019	Q1-2019	SEC and MEECC	None	Q1-2019	Q3-2019	Tender Board, TA, SEC	None	N/A (this is already covered under the budget for Activity 3.3)	Donor / Development Partner
4.2 Set up partnership (through MoU) with SIT	Q2-2019	Q2-2019	SIT, SEC, PUC, MEECC and Ministry of Education	None	Q3-2019	Q3-2019	PUC, SIT and Ministry of Education	None	2,000	Government (in-kind)
4.3 Training provided to SIT staff and benchtop equipment installed for delivering training to technicians	Q4-2019	Q4-2019	SIT, PUC, Private Partner	Organisational skills	Q4-2020	Q2-2021	SIT, PUC and Private Partner	Technical expertise provided by the Private Partner	100,000	Donor/development partner
Action 5:	**Solid waste characterisation**									
Activities	**Planning**				**Implementation**				**Costs and funding needs**	
	Start	Complete	Who	Capacity needs	Start	Complete	Who	Capacity needs	Costs (US$)	Who will fund
5.1 Draft and approve ToR for solid waste characterisation, and hire consultant to carry out characterisation	Q4-2018	Q4-2018	MEECC, LWMA	Estimating human capacity and cost needs	Q4-2018	Q4-2018	LWMA	Technical assistance	1,500	Government (in-kind)
5.2 Carry out solid waste characterisation on Mahé, La	Q4-2018	Q4-2018	LWMA and MEECC	Technical expertise in solid waste	Q1-2019	Q4-2019	LWMA and Services Providers	Technical expertise in solid waste characterisation	75,000	Donor/development partner

Digue and Praslin				characterisation						

Source: TNA project

1.1.3.6 Management Planning

This section identifies the risks to successful implementation of the TAP for waste to energy using centralised AD technology. Measures to mitigate the risks are also identified. The immediate critical steps that would be required to initiate TAP implementation are also discussed.

Risks and Contingency Planning

Table 14 provides an overview of the main risks and contingency planning for the waste to energy TAP. The main risk has been identified as performance risk that may arise from erroneous characterization of solid waste. Cost and scheduling risks have been rated as low.

Next steps

The immediate requirement to proceed with the implementation of the TAP and the proposed Project Idea (PI) is to obtain political support for the TAP. This can be secured through a two stage process, namely:

1. Cabinet approval: The MEECC, with the support of SEC, LWMA and PUC, need to ensure that the validated TAP receives the approval of the Cabinet of Ministers. The Cabinet is the highest instance of decision making in government; and
2. TAP Steering Committee: The next logical step would be to put in place a Steering Committee (SC) that will oversee the execution of the TAP and PI. It is proposed that the members of the SC will be constituted by the stakeholders listed in **Table 12**. The SC may be presided by the MEECC with the SEC acting as co-chair.

Three critical steps have been identified that need to be controlled in order to promote waste to energy for electricity generation. Each critical step serving to minimising risks identified in **Table 14**. The critical steps are also related to the fact that the uptake of waste to energy for power generation is premised on developing synergies between Actions – i.e. overcoming barriers and associated risks independently of each other will not lead to technology transfer. With these considerations in mind, the critical steps are:

- Appointment of Services Provider to develop FiT: The SEC has low level capacity for modelling the electricity tariffs and technology-specific FiTs. It is also known that in the absence of a FiT, the proposed mitigation technology will not be implemented. The Services Provider will also build human capacity so that SEC is able to model electricity tariffs and FiTs (Activity 3.1) and to revise and update same on a regular basis using the mechanisms that will be set up under Activity 1.3;
- Conducive regulatory framework: The technology will be implemented using private investments. For this to happen, the Energy Act has to be updated in order to enable the private participation in the power market; and
- Characterisation of solid waste: As discussed above (and in **Table 14**), technology performance is directly linked to the characteristics of solid waste. Hence, it is critical to have high quality data on waste characteristics that will allow potential investors to develop their business model.

Table 14. Overview of risk categories and possible contingencies for waste to energy TAP.

Type of risk	Related to Action or Activity	Description of risk	Contingency actions	
1 Cost Risks	All Activities	The cost for the activities may be higher that planned due to delays in implementation or change in scope of work. The probability of this risk is low, and the impacts are rated as low. The risk is therefore low.	***Time interval for M&E:***	6 monthly
			M&E responsibility:	MEECC, LWMA, SIT, SEC and PUC
			Contingency measures needed:	Using the proper procurement procedures and having public accountability will help keep cost in check. Also, the activities planned in the TAP are well defined, implying that their costing is also well defined with little margin for error.
			Responsibility contingency measure:	Project Team/Project Steering Committee
			Timing contingency measure:	First 3 years of TAP implementation
2 Scheduling Risks	All Activities	If the activities do not take place at the time they are scheduled, then the implication will be cost overrun, implementation delays, and loss of confidence in the mitigation technology, among others. The main impact due to delays in TAP implementation will be delayed technology transfer. Cost overrun is not expected to be significant since the activities proposed in the TAP are low-cost, and precede capital investment. The probability of this risk is low and the impact is expected to be low. The risk is rated low.	***Time interval for M&E:***	6 monthly
			M&E responsibility:	Project Manager (with support from MEECC, SEC, SNPA, SIT and SAA)
			Contingency measures needed:	First, the timeline for implementing activities have been scheduled with built in time to account for some delays in activity planning and implementation. The activity planning and implementation schedule will be monitored on a regular basis with the involvement of all stakeholders, and corrective actions taken decisively.
			Responsibility contingency measure:	Project Team and all stakeholders
			Timing contingency measure:	Year 1 and year 2 in TAP implementation
	All Activities		***Time interval for M&E:***	quarterly

3 Performance Risks		The main risk to performance relates to the characteristic of solid waste, which is a critical element that will inform technology viability and performance. Solid waste characterisation is carried out using well established norms and procedures, and the main goal would be to ensure recruitment of a high calibre Services Provider to carry out Activity 5.2. Further, technology risks arise from the state of maturity of the proposed technology. In the case of centralised AD, the technology is mature and it is routinely used for electricity generation. However, there is potential risk of variable gas production due less control process control and varied waste base in a landfill. This will affect power output and the corresponding economics The probability of this risk is low-to-medium, but the impact can be high. Therefore, the risk is rated high.	***M&E responsibility:***	MEECC and LWMA
			Contingency measures needed:	The main mitigation measure is to ensure that the TOR that is the subject of Activity 5.1 is done correctly in order to ensure that the most qualified Services Provider is recruited to carry out solid waste characterisation.
			Responsibility contingency measure:	MEECC and LWMA
			Timing contingency measure:	Year 1 and year 2

Source: TNA project

1.1.3.7 TAP overview table – Waste to Energy for Power Generation

The overview of the TAP for waste to energy for electricity generation is given in **Table 15**.

Table 15. TAP overview table for Waste to Energy.

Sector	**Energy**							
Sub-sector	Power generation							
Technology	Waste to Energy using centralised biodigester							
Ambition	The target is to generate 4 MW of grid-fed power from centralised anaerobic digestion of landfill waste by 2020.							
Benefits	The sustainable development benefits of the TAP are: (1) cumulative direct GHG emission reductions in 2030 of ~209 $ktCO_2$; (2) creation of 52 direct green jobs (combination of construction and implementation, and O&M); and (3) a cumulative avoided cost on energy bill to 2030 of ~US$ 44.8 million. Another benefit of the technology is the reduction in space needed for landfilling municipal solid waste.							
Action	**Activities to be implemented**	**Sources of funding**	**Responsible body and focal point**	**Time frame**	**Risks**	**Success criteria**	**Indicators for Monitoring of implementation**	**Budget per activity**
Action 1: Set up appropriate FiT scheme	Activity 1.1: Appoint an energy economist to develop FiT for waste to energy (and other renewables)	Government (through the SEC)	SEC (with support from MEECC)	Q4-2018 to Q1-2019	Competent Services Provider will not be attracted	FiT developed and approved	- Appointment of Energy Economist - FiT developed - FiT approved	45,000
	Activity 1.2: Develop model for setting tariffs (electricity and FiTs) with complete transfer of knowledge and expertise to SEC staff	Donor / Development Partner	SEC (with technical support from Energy Economist, and involving MEECC and PUC)	Q1-2019 to Q2-2019	- Modelled tariffs not accepted by all parties - Institution alisation of modelling tool not successful	Model for setting tariffs developed; SEC staff capacitated to carry out tariff modelling	- Tariff setting model developed - Number of SEC staff capacitated	50,000
	Activity 1.3: Set up system to monitor and update tariffs (electricity and FiTs) on a regular basis	Donor / Development Partner	SEC and MEECC	Q2-2019	System to update tariffs and FiT is not institutionali sed	System to update tariffs and FiT is operationalized at SEC	- Number of system established - Number of times system is used to update tariffs and FiT	20,000 (per update)
Action 2: Updating the Energy Act 2012 to allow private	Activity 2.1: Update the Energy Act 2012	Donor/ Development partner	MEECC	Q1-2019 to Q3-2019	Resistance to opening the power market to	Energy Act is updated with provision for private sector	Energy Act updated	30, 000 (2019) [*30,000 (2027)*]

participation in the power market					private actors	participation in the power market and feed-in tariffs for renewable energies are scheduled		
	Activity 2.2: Initiative transparent technology bidding process	Donor / Development Partner	Tender Board and SEC	Q2-2019 to Q4-2019	Low institutional capacity for implementing bidding process	Bidding process has been completed with the selection of private partner for the implementation of 4 MW of waste to energy by 2020	- Transparent bidding process in place and put into use - Number of responsive bids from potential strategic partners	10,000
Action 3: Institutional strengthening	Activity 3.1: Equip SEC with appropriate tools and software to deliver on duties	Donor/ Development partner	SEC	Q1-2019 to Q2-2019	Lack of absorption capacity at SEC	Technical capacity for modelling tariffs and other financial/economic instruments for the power sector is in place at SEC	Number of staff trained to carry out tariff modelling and to carry out financial/economic analyses	15,000 (linked with Activity 1.2)
	Activity 3.2: Set up support institutions such as an arbitration court	Donor/ Development partner	MEECC and SEC [Focal pt: Department of Legal Affairs]	Q4-2019 to Q2-2021	Lack of political support for setting up court	Arbitration Court is set up and operational by Q2-2021	Arbitration Court established	15,000 (does not cover the cost of staffing since this is expected to be covered through government recurrent budget)
	Activity 3.3: Establishing transparent tendering procedures and standardised PPA documents	Donor/ Development partner	SEC [Focal pt: Department of Legal Affairs]	Q1-2019 to Q3-2019	Resistance to establish a transparent tendering process	Tendering process has been established and used to select most appropriate strategic private	- Number of procedures and standardised documents developed - Number of private bidders that have	15,000

						partner by Q4-2019	used the tendering process - Feedback from bidders regarding the bidding process	
	Activity 3.4: Carry out detailed stakeholder mapping for all actors involved in waste to energy generation, and define roles and responsibilities	Government	MEECC and SEC	Q1-2019 to Q2-2019	Low institutional commitment of stakeholders	Institutional mapping completed and roles and responsibilities of stakeholders have been defined and endorsed	- Number of institutional stakeholders participating in mapping process - Endorsement of stakeholder roles and responsibilities	10,000
	Activity 3.5: Set up a multi-stakeholder committee to enhance stakeholder coordination and provide oversight of technology implementation	Government	MEECC	Q2-2019 to Q3-2019	Lack of participation from key institutional stakeholders	Multi-stakeholder committee set up and operationalized through regular meetings	- Number of institutional members participating in committee (derived from mapping carried out under Activity 3.4) - Number of meetings and key decisions taken to promote waste to energy technology	2,500
Action 4: Skills enhancement in waste to energy	Activity 4.1: Ensure that skills transfer is included in tendering dossier	Donor / Development Partner	SEC [Focal pt: Tender Board]	Q1-2019 to Q3-2019	Skills transfer clause omitted from tendering dossier	Tendering dossier includes articles for skills transfer to local institutions by the successful Strategic Partner	Tendering dossier with necessary articles on skills transfer developed	N/A (this is already covered under the budget for Activity 2.2)
	Activity 4.2: Set up partnership with SIT	Government (in-kind)	SIT [Focal pt: Ministry of Education]	Q2-2019 to Q3-2019	Low interest from SIT to develop course	MOU signed between SIT and PUC, and training course is developed	- Number of MOU signed - Number of courses developed - Number of participants in courses developed	2,000
	Activity 4.3: Provide training to SIT staff and benchtop equipment	Donor/ Development partner	SIT	Q4-2019 to Q2-2021	Lack of local demand for training	Sufficient number of technicians	Number of technicians trained on waste to energy	100,000

	installed for delivering training to technicians					trained in waste to energy O&M		
Action 5: Solid waste characterisation	Activity 5.1: Draft and approve ToR for solid waste characterisation, and hire consultant to carry out characterisation	Government (in-kind)	MEECC and LWMA	Q4-2018	Low quality ToR results in the recruitment of low profile services provider	High calibre services provider is recruited	- ToR developed - Recruitment of service provider completed	1,500
	Activity 5.2: Carry out solid waste characterisation on Mahé, La Digue and Praslin	Donor/ Development partner	LWMA	Q4-2018 to Q4-2019	Necessary technical expertise to carry out solid waste characterisation not available	High quality solid waste characterisation completed on three populated islands	Data for 12 months on characteristics of solid waste on Mahé, La Digue and Praslin	75,000

Source: TNA project

1.1.4 Action Plan for Biomass Power Generation

1.1.4.1 Introduction

The biomass project is intended to look at innovative ways to increase energy security by using abundant local resources that can supply firm power. In addition to mitigation benefits, biomass derived from agro-forestry and agricultural residues can also address the need for improved food security and increased energy resources, as well as the need to sustainably manage agricultural landscapes. It can also be used as a means of managing biodiversity when native plant species are harvested for thermal power generation.

Two technologically mature and cost-attractive options involve burning biomass in standalone units or co-firing it with fossil fuels in standard thermal power plants. The option being considered for the Seychelles is the (central) combustion technology, which is the most common way of converting solid biomass fuels to energy. However, there will need to be a proper feasibility study to determine the specific technology that will be suitable for the local conditions (Government of Seychelles, 2017b).

1.1.4.2 Ambition for the TAP

The target is to generate 5MW of baseload power from biomass products in 2025.

1.1.4.3 Actions and Activities selected for inclusion in the TAP

The action plan follows the same approach that has been outlined in section 1.1.2.3. The Actions are linked to the measures that were identified following detailed analyses of barriers facing the technology (Government of Seychelles, 2017b), as well as the anabling environment required to promote the technology. The Project Idea will focus on promoting an enabling environment that will be supportive of other mitigation technologies, such as putting in place the appropriate legal and regulatory frameworks, and to cash on low-hanging fruits.

Summary of barriers and measures to overcome barriers

A summary of the barriers and measures identified for the biomass power project is given in **Table** 16. They are derived from the TNA Barriers Analysis and Enabling Framework Report – Mitigation (Government of Seychelles, 2017b). The legal and regulatory barriers are the same as those faced by the previous mitigation technologies. The economic and financial, and institutional barriers overlap with those for waste to energy.

Table 16. Overview of barriers and measures to overcome these for biomass power project.

Categories	Identified barriers	Measures to overcome barriers
Economic and financial	Lack of financial incentive to make technology financially attractive and provide investment visibility	A tariff incentive is set at 0.88% of the marginal cost of production using fuel oil
Legal and regulatory	• Existing legislation prevents investments from independent power producers • The Seychelles Energy Commission (SEC), acting as regulator for the power sector, lacks the authority or capacity to adequately regulate the sector • Lack of standardised PPA and tendering process	• Updating the Energy Act 2012: (1) to define the power sector market activities and the roles of market actors; and (2) to give the SEC the powers it needs to regulate the entire electricity market sector • Accompanying institutional and human capacity strengthening for the SEC through a combination of trainings and exchanges with overseas energy sector regulators • Developing a standardised PPA and tendering process
Institutional and organisational capacity	Lack of coordination and synergy between stakeholders	Carrying out a detailed institutional review of all the relevant institutions, and formulating clear guidelines for

		institutional roles and responsibilities according to institutional mandates
Human skills	Little domestic expertise to implement the technology	Developing human capacity and expertise by providing appropriate training in power generation from thermal combustion of biomass
Technical	Lack of detailed data on biomass resources for power generation	Carrying out a detailed characterisation of biomass resources, including biomass residues and invasive species

Source: TNA project

Actions selected for inclusion in the TAP (Biomass for power generation)

All the measures identified in **Table 16** need to be implemented in order to achieve the target of 5 MW installed capacity (Government of Seychelles, 2017b). Consequently, all the identified measures are ranked as medium to high in terms of urgency. An assessment of the urgency of measures considered for inclusion in the TAP is given in **Table 17**. The measures are based on the problem/objective trees from the BAEF and have already been identified as critical for inclusion in the TAP (Republic of Seychelles, 2017b). Hence, all the measures discussed in **Table 9** have been retained as Actions for the biomass for power generation TAP. The measures are grouped by category of barriers.

Table 17. Assessment of measures for biomass power project.

Measures to overcome barriers	Assessment	Ranking
Financial & Economic Barriers Provision of a financial incentive in the form of a feed-in-tariff that is set at 0.88% of the marginal cost of production using fuel oil	One of the main risks faced by potential investors is the inability to have market visibility and technology viability in the absence of a sound financial model to justify the upfront high capital investments. There is currently no set incentive for mitigation technologies of national interest but with limited scope for scaling up such as power generation from biomass feedstocks. Even in the presence of the most conducive enabling framework, the economic and financial barriers will halt technology implementation because investors are not able to carry out detailed financial modelling to justify investments. Similar to the case of waste to energy, stakeholders have proposed a FiT. The financial measure will benefit from the existence of an enabling environment to promote private sector investments in the power sector (as discussed next in this table).	high
Legal and Regulatory Barriers Updating the Energy Act 2012	The Energy Act was recently established and there is no immediate plan to update it in order to allow private operators in the power sector. Nor is it contemplated to enhance the institutional capabilities of the energy regulator. So, in the absence of the proposed measures, the status quo will be maintained and the uptake of the technology will either not take place or be delayed. The government has voiced in favour of technology implementation by a private investor (Government of Seychelles, 2017b). However, the current legal framework prohibits private sector involvement in the power market. For the technology to be implemented, the legislation governing the power sector will have to be changed accordingly. The proposed measure to deregulate the power market will also require the setting up of a transparent tendering process and procedures (e.g. standardised PPA). This measure is seen as critical for enhancing the power sector enabling	high

Measures to overcome barriers	Assessment	Ranking
	framework, implying that it should be considered as a first step for intervention.	
Institutional & Organisational Barriers Improving institutional and organisational capacity	The generation of power from biomass products is a cross-sectoral issue. One that requires close coordination between different line ministries (e.g. Ministry of Fisheries and Agriculture, Ministry of Environment, Energy and Climate Change, Ministry of Finance, Trade and the Economic Planning, Ministry of Land Use and Habitat) and other stakeholders (e.g. PUC, Seychelles Energy Commission, Seychelles Agricultural Agency, local communities). The efficient and effective design, conceptualisation and implementation of the mitigation technology will require close coordination between all these stakeholders. Currently, one significant barrier facing the technology is insufficient coordination between relevant ministries and stakeholders. This can be as simple as the sharing of data to draw up projects or the alignment of strategies for the sustainable management of biomass residues in Seychelles. There is also low institutional capacity for putting in place a transparent tendering process, including a recourse mechanism for addressing any grievances of bidders.	high
Human Capacity Barrier Improving human skills	One of the issues with the technology is the availability of human skills to develop and implement the technology, and, above all, to provide the necessary after sales service and maintenance support. This barrier can be circumvented by opening the tendering process to pre-qualified bidders that will have the onus to also build local capacity. Hence, the issue of lack of local human expertise is not as a significant barrier as the other barriers discussed in this table.	Medium
Technical Barrier Validating the quantity of biomass resources to inform technology feasibility and viability	While estimations of biomass resources have been made to calculate the power generation potential of 5 MW, it will be necessary to validate the availability of resources through a ground truthing exercise. The data can then be made publicly available so that they can be used by potential project developers to inform their bids.	High

Source: TNA project

Activities identified for implementation of selected Actions

Five Actions have been retained for inclusion in the TAP for biomass based on the priority and urgency of the measures identified in **Table 17**. The activities for each Action are listed in **Table 18**. As mentioned above, the measures and Actions identified for promoting biomass for power generation are similar to those for waste heat receovery and waste to energy. Consequently, the Activities that define each Action in Table 18 are similar to those for the previous two mitigation technologies, and especially waster to energy.

Table 18. Summary of Actions for biomass for power generation TAP and their corresponding Activities.

Summary of Actions	
Action 1:	**Introducing a FiT to promote technology**
Action 2:	**Institutional strengthening for the SEC**
Action 3:	**Setting up a steering committee (SC) for the coordination of activities within the energy sector**
Action 4:	**Increasing specialised technical training**
Action 5:	**Carry out detailed biomass resources assessment in Seychelles**

Activities for Action implementation	
Action 1: Introducing a FiT to promote this technology	
Activity 1.1	SEC to hire an economist to work on tariffs (biomass and other renewables)
Activity 1.2	Develop and implement a model to calculate and set tariffs
Activity 1.3	Train economist to use the model
Activity 1.4	Set up system to continually monitor and update tariffs
Action 2: Updating the Energy Act 2012 to allow private participation in the power market	
Activity 2.1	Update the Energy Act 2012 to reflect the country's policy and to define the legal framework for private sector participation in power generation
Activity 2.2	Initiate transparent technology bidding process, including developing tendering documents (Expression of Interest and Request for Proposal), to attract qualified private partners
Action 3: Institutional strengthening	
Activity 3.1	Equip SEC with appropriate tools and software to deliver on duties, including capacity to model and implement pricing mechanisms / electricity tariffs
Activity 3.2	Set up support institutions such as an arbitration court to strengthen SEC in its role as regulator
Activity 3.3	Establishing transparent tendering procedures and standardised PPA documents in the power sector to attract private investor to implement biomass for power generation
Activity 3.4	Carry out detailed stakeholder mapping for all actors involved in biomass for power generation, and define roles and responsibilities
Activity 3.5	Set up a multi-stakeholder committee to enhance stakeholder coordination and provide oversight of technology implementation (based on the results of Activity 3.4)
Action 4: Increasing specialised technical training	
Activity 4.1	Prepare curriculum and technical material for training of trainers and technicians
Activity 4.2	Train the trainers
Activity 4.3	Acquire materials and equipment for training
Action 5: Carryout detailed biomass resources assessment (biomass) in Seychelles	
Activity 5.1	Prepare ToR and hire consultant for carrying out an assessment of biomass resources
Activity 5.3	Carry out biomass resources assessment and produce final report

Source: TNA project

Actions to be selected as Project Ideas

A Project Idea (PI) is proposed to kick-start the implementation of the TAP by focusing on 'low-hanging fruits' and Activities that are of immediate urgency. Some Actions are also considered urgent because they provide an enbling environment supportive of the implementation of the other Actions/Activities, and that are also supportive of the uptake of other mitigation technologies in the power sector. Because of similarities, the PI for biomass is similar to that for waste to energy, including:

- Action 1 (Activity 1.1 and Activity 1.2): Developing the FiT is an important first step towards providing long-term financial visibility to potential investors. Activity 1.2 is related to Activity 3.1 that is discussed below;
- Action 2 (all Activities): This Action is identified as the necessary first step to technology transfer in the power sector. The urgency of carrying out institutional and regulatory reforms in the power sector has been discussed in **Table 17**;
- Action 3 (Activity 3.1): Developing a FiT has been identified as an enabler of the mitigation technology, and a 'low hanging fruit' would be to equip the SEC with the appropriate tools for developing pricing mechanisms and tariffs. Acitivity 3.1 is therefore proposed to be carried out in conjunction with Activity 1.1; and
- Action 5 (all Activities): In parallel, it is most important to carry out a full characterisation of biomass resources that would be available for power generation. This data will allow investors to develop their business model.

1.1.4.4 Stakeholders and Timeline for implementation of TAP

This section identifies the stakeholders who will be responsible to implement the Actions, as well as a clear definition of their roles in the process. It also gives the sequence and timing of each Activity.

Overview of Stakeholders

The action-specific roles of the main stakeholders for the implementation of the TAP for biomass for power generation are given in **Table 19**.

Table 19. Roles of stakeholders involved in the implementation of the biomass for power generation TAP.

Key Stakeholders	Role
Ministry of Environment, Energy and Climate Change (MEECC) (Actions 2 and 3)	The MEECC is the parent ministry in charge of formulating policies for the energy sector (including power sector), as well as overseeing the development of policy instruments such as legislation and institutional arrangements in order to implement the policies. The Principal Secretary of the Department of Energy and Climate Change at MEECC is also the chairperson of the Seychelles Energy Commission (SEC). The MEECC will be directly responsible for updating the Energy Act 2012 (Action 2), and it will support institutional strengthening of the regulator (Action 3).
Ministry of Fisheries and Agriculture (MFA) (Action 3 and 5)	One of the missions of the MFA is to enable Seychelles to optimise on the use of its natural resources with opportunities to create jobs across the agriculture and food value chain. One natural resource that can be used to create value in the agriculture value chain is agricultural residues for power generation. However, the MFA must first develop guidelines for the sustainable use of such residues for power generation since diverting agricultural residues may be detrimental to long-term agricultural productivity. The Ministry will therefore be an important stakeholder on the multi-stakeholder committee that is proposed under Activity 3.5. It can also support the process of characterising agricultural residues in Seychelles.
Seychelles Agricultural Agency (SAA) (Action 3 and 5)	The SAA operates under the aegis of the MFA, and its mandate is to operationalise the policies and strategies of the Ministry. In particular, its role is to provide goods and services to the food producing entrepreneurs. Together with the MFA, it will be a key stakeholder in coordinating activities related to agricultural residues that may be used as feedstock for power generation. As the technical arm of MFA, it will provide support in characterization of agricultural residues under Action 5.
Seychelles National Parks Authority (SNPA) (Actions 3 and 5)	The SNPA is responsible for all of the marine and terrestrial national parks of Seychelles. Its vision is to effectively protect and manage designated marine and terrestrial protected areas including forested areas for future generations with the intention to use them for conservation, recreation, research and educational purposes. The SNPA is, therefore, mandated to oversee the sustainable management of forests and the sustainable use of timber and non-timber products in Seychelles. The Forestry Section carried several activities that are supportive of the proposed mitigation technology, such as: assisting with the development and implementation of forest policies and related legislations; managing state forest sustainably, undertaking routine maintenance, integrated management, development and extension of forest plantation and reserve, and undertaking and managing the harvesting and use of timber and non-timber forest products. The SNPA will be involved in carrying out forestry resources assessments, including the amount of renewable biomass and invasive species that can be harvested from forests. The SNPA will also form part of the multi-stakeholder committee that is proposed under Activity 3.5.
Seychelles Energy Commission (Actions 1 and 3)	As the Regulator for the energy sector, the SEC will be directly responsible for developing the FiT proposed under Action 1. As a direct beneficiary, the SEC will receive institutional strengthening under Action 3.

Key Stakeholders	Role
Public Utilities Corporation (PUC) (Actions 1 and 2)	The PUC is the incumbent in the power market, and it owns and controls the national grid. The PUC will also be the off taker of electricity generated from the biomass power project, and, consequently, will be involved in the development of FiT scheme. It will also be consulted as a key stakeholder in the power sector for implementing the Activities under Action 2.
Ministry of Habitat, Infrastructure and Land Transport (MHILT) (Action 5)	The mission of MHILT is to facilitate the national socio economic development through sustainable and efficient use of our land resources for habitat, economic, social and infrastructure needs through effective policy framework, regulations and provision of ancillary technical services. Among others, the Ministry has several core functions that are linked to the proposed technology, such as: (i) responsibility for land policy and land related legislation and timely review thereof; (ii) developing the Geographic Information System (GIS) Centre of the Ministry and ensuring the efficient use of acquired digital data throughout Government with the set objective of improving performance and decision-making in Government; and (iii) preparing Land Use Plans and Urban Development guidelines, among others.[4] Consequently, the Ministry, through the GIS Centre, will play an important role in biomass resources assessments (Activity 5.2). If needed, it can also play a role in developing necessary policies and guidelines for the sustainable cultivation of biomass feedstocks dedicated for power generation.
Seychelles Institute of Technology (SIT) (Action 4)	It was mentioned in the BAEF Report – Mitigation (Government of Seychelles, 2017b) that any accredited training related to human technical capacity building on the mitigation technologies proposed in the TNA project will be carried out by the SIT. With the support of the private investor, the SIT will develop the necessary courses on waste to energy for power generation. Given that Seychelles is constrained by its limited pool of human capital (due to its very small population), it is proposed that any new training material be either incorporated into an existing course on power generation or industrial processes requiring heat and steam.

Source: TNA project

Scheduling and sequencing of specific activities

A detailed timetable for the activities can be found in the planning table below (**Table 20**). The TAP for biomass is planned for implementation between 2018-2026, and the sequencing of Actions is given below. Although the technology is not expected to be implemented before 2025, the timing (and sequencing) of Actions 1, 2 and 3 have been set much earlier because they are common to the two provious mitigation technologies. For instance, the FiT scheme will not be carried out for biomass only but also for other technologies such as waste to energy that will be implemented earlier than biomass for power generation. Similarly, institutional strengthening (Action 3) and updating the Energy Act 2012 to allow private sector participation in the power sector (Action 2) will be supportive of all mitigation technologies, and hence need to be implemented earlier in the work programme.

Action 1: Set up appropriate FiT scheme – Urgent start in year 1 (Q4-2018) and completed in year 2 (Q2-2019);

Action 2: Updating the Energy Act 2012 to allow private participation in the power market – It is envisaged that this is vital for creating the enabling environment for promoting transfer of the mitigation technology (and the previous power sector mitigation technologeis). As explained above, this action will form part of the PI note, and consequently will need to be implemented upfront. Therefore, this action will be initiatied at the beginning of year 2 (Q1-2019), with the legislation updates completed within the first 9 months of implementation start. It is also envisaged that the policy and accompanying legal and regulatory frameworks will be updated, if needed, in 2027. The transparent technology bidding process will be carried in year 2;

Action 3: Institutional strengthening – The activities will be initiated in year 2 (2019), and activities such as the setting up of an Arbitration Court will take place in 2021;

[4] http://www.luh.gov.sc/default.aspx?PageId=52 – accessed 3 May 2018.

Action 4: Skills enhancement in biomass for power generation – This Action will be synchronised with the period of installation and commissioning of the technology, which is expected to take place in 2025 (year 7). Preparation and planning will start in year 3 (2021); and
Action 5: Biomass resources assessment – The MFA, with the support of SAA, and the SNPA will take steps to carry out a detailed chatracterisation of biomass resources on the three populated island of Seychelles. The characterisation will need to be completed over a 12 months period in order to account for seasonal trends in biomass resources that can be harvested. The characterisation will be carried out in 2022.

1.1.4.5 Estimation of Resources Needed for Action and Activities

This section discusses the capacity building elements of the TAP, as well as an estimation of its implementation costs.

Estimation of capacity building needs

Capacity building is an element that cuts across all the Actions, and is justified from the perspective that human and institutional learning will take place through the implementation of all activities constituting the TAP. Nevertheless, there are dedicated capacity building activities that underpin efforts to overcome human capacity and institutional barriers (**Table 16**). These are:

- Activity 3.1: Equip SEC with appropriate tools and software to deliver on duties, including capacity to model and implement pricing mechanisms / electricity tariffs; and
- Activity 4.3: Training provided to selected staff (e.g. SEC, MEECC) and technicians on biomass technologies.

It is also pointed out that capacity needs during the planning and implementation stages of the TAP (**Table 20**) are often taken care of through the implementation of some of the Activities. For instance, the private investor that will be chosen to implement biomass for power generation (Activity 3.3) will support SIT in developing necessary training courses on the proposed mitigation technology.

Estimations of costs of actions and activities

The cost of each Activity constituting the TAP is provided in **Table 20**. The total cost is estimated at US$ 447,000 that will be funded through a combination of cash/grant and in-kind financing. The in-kind financing is estimated at US$12,000 for Actvities 3.5, 4.1, 4.2 and 5.1. Further, government is expected to contribute US$ 55,000 for implementing Activity 1.1 and Activity 3.4. The long-term contribution of government is expected to be higher through the staffing of the proposed Arbitration Court. The salary and administrative costs associated with this unit is not budgeted in the TAP, as it is proposed to be funded through the recurrent budget. Therefore, US$ 380,000 is expected to be funded through the financial support of donors and development partners, including international climate finance sources.

The above cost estimate needs to be qualified since it does not include activity costs that will accrue in the future such as for Activity 1.3 that is expected to incur a total of US$100,000 to review tariffs every 2 years after 2020, and Activity 2.1 where it is proposed that a further US$ 30,000 will be needed for updating the energy policy and its related legislations in 2027. The recurrent budget neded to staff and operate the Arbitration Court (Activity 3.2) is also not included in the budget estimate for the TAP. The technology costs related to capital investment and O&M are not part of the TAP since these will be born by the private investor against a return on investmnet that will be secured through the FiT proposed under Action 1. In carrying our the benefit cost analysis of biomass for power generation (Government of Seychelles, 2017b), the incremental cost of providing a FiT set at 0.88% of the marginal cost of production using fuel oil was estimated at US$ 1.13 million per year. Assuming that the technology will be implemented by the end of 2025, the cumulative cost of providing a FiT to 2030 is estimated at US$ 5.66 million.

Table 20. Planning table - characterisation of activities for implementation of actions for Biomass for power generation.

Action 1:	**Set up appropriate FiT scheme**									
Activities	**Planning**				**Implementation**				**Costs and funding needs**	
	Start	Complete	Who	Capacity needs	Start	Complete	Who	Capacity needs	Costs (US$)	Who will fund
1.1 Appoint an energy economist to develop FiT for waste to energy (and other renewables)	Q4-2018	Q4-2018	SEC	Definition of Terms of Reference (ToR) for energy economist	Q1-2019	Q1-2019	SEC (with support from MEECC)	none	45,000	Government (through the SEC)
1.2 Develop model for setting tariffs (electricity and FiTs) with complete transfer of knowledge and expertise to SEC staff	Q1-2019	Q1-2019	SEC, MEECC and PUC	None (covered under definition of ToR)	Q1-2019	Q2-2019	Energy economist under supervision of SEC, and selected SEC staff	None (covered by technical inputs from Energy Economist)	50,000	Donor / Development Partner
1.3 Set up system to monitor and update tariffs (electricity and FiTs) on a regular basis	Q2-2019	Q2-2019	SEC, MEECC	None	2020	2030 (done periodically as determined by system to be established)	SEC, MEECC	Economic Analysis, and Measurement, Reporting and Verification (MRV) system	20,000 (per update) (it is assumed that the tariffs will be revised and updated, if necessary, every 2 years, implying a total budget of US$100,000 between 2020 and 2030)	Donor / Development Partner
Action 2:	**Updating the Energy Act 2012 to allow private participation in the power market**									

Activities	Planning				Implementation				Costs and funding needs	
	Start	Complete	Who	Capacity needs	Start	Complete	Who	Capacity needs	Costs (US$)	Who will fund
2.1 Updating the Energy Act 2012	Q1-2019	Q1-2019	MEECC	Estimating human capacity and cost	Q1-2019	Q3-2019 (revision also planned in 2027)	MEECC (with inputs from external Services Providers)	Legal and regulatory frameworks for catalysing private investments in the power market (provided through contracting of external Services Providers)	30, 000 (2019) [*30,000 (2027)*]	Donor/development partner
2.2 Initiate transparent technology bidding process to select qualified private partner	Q1-2024	Q1-2024	SEC	Technical expertise on bidding process	Q2-2024	Q4-2024	Tender Board, SEC, Services Providers (of technical assistance)	None	10,000	Donor / Development Partner
Action 3:	**Institutional strengthening**									
Activities	**Planning**				**Implementation**				**Costs and funding needs**	
	Start	Complete	Who	Capacity needs	Start	Complete	Who	Capacity needs	Costs (US$)	Who will fund
3.1 Equip SEC with appropriate tools and software to deliver on duties	Q1-2019	Q1-2019	SEC	Estimating human capacity gap and cost	Q1-2019	Q2-2019	SEC (with inputs from external Services Providers) - This is linked with Activity 1.2	Technical capacity for modelling tariffs and other financial/economic instruments for the power sector	15,000	Donor/development partner
3.2 Set up support institutions, such as Arbitration Court	Q4-2019	Q2-2020	MEECC, SEC and Department of Legal Affairs	Institutional structure and mandate of Arbitration Court	Q3-2020	Q2-2021	MEECC, SEC and Department of Legal Affairs (with inputs from external Services Providers)	High calibre human expertise	15,000 (does not cover the cost of staffing since this is expected to be covered through	Donor/development partner

									government recurrent budget)	
3.3 Establishing transparent tendering procedures and standardised PPA documents	Q1-2019	Q1-2019	SEC and Tender Board (with technical input from Services Providers)	Technical content of tendering documents	Q1-2019	Q3-2019	SEC and Tender Board	Legal and procedural expertise (provided by Services Providers for Activity 2.1)	15,000	Donor/development partner
3.4 Carry out detailed stakeholder mapping for all actors involved in biomass for power generation, and define roles and responsibilities	Q3-2019	Q3-2019	SEC, MFA, MEECC and SNPA	Capacity to define ToR for institutional mapping	Q4-2019	Q1-2020	SEC, MFA, MEECC and SNPA	None (institutional mapping expertise provided by Services Providers)	10,000	Government
3.5 Set up a multi-stakeholder committee to enhance stakeholder coordination and provide oversight of technology implementation	Q2-2020	Q2-2020	SEC, MFA, MEECC and SNPA	None	Q3-2020	Q4-2020	SEC, MFA, MEECC and SNPA	None	2,500	Government (in-kind)
Action 4:	**Skills enhancement in biomass for power generation**									
Activities	**Planning**				**Implementation**				**Costs and funding needs**	
	Start	Complete	Who	Capacity needs	Start	Complete	Who	Capacity needs	Costs (US$)	Who will fund (Step 4.3)
4.1 Prepare curriculum and technical material for teaching	Q1-2021	Q2-2021	SIT, SEC, Ministry of Education, PUC	Curriculum design and pedagogy skills	Q2-2021	Q4-2021	SIT and Ministry of Education	Curriculum design and pedagogy skills	3,000	Government (in-kind)

4.2 Train the trainers	Q2-2023	Q3-2023	SIT and Ministry of Education	Specifying selection criteria for trainees	Q1-2024	Q2-2024	SIT	None	5,000	Government (in-kind)
4.3 Acquire materials and equipment for training	Q1-2022	Q2-2022	SIT, PUC and SEC	Technical specifications for training equipment	Q3-2022	Q1-2023	SIT	Technical expertise to set up laboratory equipment	100,000	Donor/development partner
Action 5:	**Solid waste characterisation**									
Activities	**Planning**				**Implementation**				**Costs and funding needs**	
	Start	Complete	Who	Capacity needs	Start	Complete	Who	Capacity needs	Costs (US$)	Who will fund
5.1 Prepare ToR and hire consultant for carrying out an assessment of biomass resources	Q1-2021	Q1-2021	MEECC, MFA, SAA, MHILT and SNPA	Estimating human capacity and cost needs	Q2-2021	Q3-2021	SAA and SNPA	Technical assistance	1,500	Government (in-kind)
5.2 Carry out biomass resources assessment and produce final report	Q4-2021	Q4-2021	MFA, SAA and SNPA	Technical expertise in characterisation of biomass resources	Q1-2022	Q4-2022	SAA, SNPA, MHILT and Services Providers	Technical expertise in biomass resources assessments using both geographic information systems and ground truthing	125,000	Donor/development partner

Source: TNA project

1.1.4.6 Management Planning

This section identifies the risks to successful implementation of the TAP for biomass to generate electricity using biomass combustion technology. Measures to mitigate the risks are also identified. The immediate critical steps that would be required to initiate TAP implementation are also discussed.

Risks and Contingency Planning

An overview of the main risks and contingency planning for the biomass for power TAP is given in **Table 21**. The main risk has been identified as performance risk that may arise from erroneous characterisation of renewable biomass feedstocks. Cost and scheduling risks have been rated as low.

Next steps

The immediate requirement to proceed with the implementation of the TAP and the proposed Project Idea (PI) is to obtain political support for the TAP. This can be secured through a two stage process, namely:

3. Cabinet approval: The MEECC, with the support of SEC, MFA, SNPA and PUC, need to ensure that the validated TAP receives the approval of the Cabinet of Ministers. The Cabinet is the highest instance of decision making in government; and
4. TAP Steering Committee: The next logical step would be to put in place a Steering Committee (SC) that will oversee the execution of the TAP and PI. It is proposed that the members of the SC will be constituted by the stakeholders listed in **Table 19**. The SC may be presided by the MEECC with the SEC acting as co-chair.

Three critical steps have been identified that need to be controlled in order to promote biomass for electricity generation. Each critical step serving to minimising risks. The critical steps are also related to the fact that the uptake of biomass for power generation is premised on developing synergies between Actions – i.e. overcoming barriers and associated risks independently of each other will not lead to technology transfer. With these considerations in mind, the critical steps are:

- Appointment of Services Provider (Energy Economist) to develop FiT: The SEC has low level capacity for modelling the electricity tariffs and technology-specific FiTs. It is also known that in the absence of a FiT, the proposed mitigation technology will not be implemented. The Services Provider will also build human capacity so that SEC is able to model electricity tariffs and FiTs (Activity 3.1) and to revise and update same on a regular basis using the mechanisms that will be set up under Activity 1.3;
- Conducive regulatory framework: The technology is expected to be implemented using private investments. For this to happen, the Energy Act has to be updated in order to enable the private participation in the power market; and
- Characterisation of biomass resources: As discussed above (and in **Table 17**), technology performance is directly linked to the characteristics of biomass resources. Hence, it is critical to have high quality data on the availability (quantity and quality for combustion) of biomass feedstocks that will allow potential investors to develop their business model.

Table 21. Overview of risk categories and possible contingencies for the biomass TAP.

Type of risk	Related to Action or Activity	Description of risk	Contingency actions	
1 Cost Risks	All Activities	The cost for the activities may be higher that planned due to delays in implementation or change in scope of work. The probability of this risk is low, and the impacts are rated as low. The risk is therefore low.	***Time interval for M&E:***	6 monthly
			M&E responsibility:	MEECC, SEC, SIT, SNPA and SAA
			Contingency measures needed:	Using the proper procurement procedures and having public accountability will help keep cost in check. Also, the activities planned in the TAP are well defined, implying that their costing is also well defined with little margin for error.
			Responsibility contingency measure:	Project Team/Project Steering Committee
			Timing contingency measure:	First 5 years of TAP implementation
2 Scheduling Risks	All Activities	If the activities do not take place at the time they are scheduled, then the implication will be cost overrun, implementation delays, and loss of confidence in the mitigation technology, among others. The main impact due to delays in TAP implementation will be delayed technology transfer. Cost overrun is not expected to be significant since the activities proposed in the TAP are low-cost, and precede capital investment. The probability of this risk is low and the impact is expected to be low. The risk is rated low.	***Time interval for M&E:***	6 monthly
			M&E responsibility:	Project Manager (with support from MEECC, SEC and LWMA)
			Contingency measures needed:	First, the timeline for implementing activities have been scheduled with built in time to account for some delays in activity planning and implementation. The activity planning and implementation schedule will be monitored on a regular basis with the involvement of all stakeholders, and corrective actions taken decisively.
			Responsibility contingency measure:	Project Team and all stakeholders
			Timing contingency measure:	First 3 years in TAP implementation
	All Activities		***Time interval for M&E:***	quarterly

3 Performance Risks		The main risk to performance relates to the characteristic of biomass resources available on a renewable basis for combustion, which is a critical element that will inform technology viability and performance. The characterisation of biomass resources is expected to be carried out using well established norms and procedures, and using a combination of GIS data and ground trothing. Further, a high calibre Services Provider will be recruited to carry out Activity 5.2 in order to minimise errors and large uncertainties in resources characterisation. Further, technology risks arise from the state of maturity of the proposed technology. In the case of biomass combustion, the technology is mature and it is routinely used for electricity generation. However, there is the risk that sufficient biomass feedstocks may not be available for a 5MW plant. The probability of this risk is low-to-medium, but the impact can be high. Therefore, the risk is rated high.	***M&E responsibility:***	SEC, SAA and SNPA
			Contingency measures needed:	The main mitigation measure is to ensure that the TOR that is the subject of Activity 5.1 is done correctly in order to ensure that the most qualified Services Provider is recruited to carry out solid waste characterisation.
			Responsibility contingency measure:	SAA, SNPA, MHILT and SEC
			Timing contingency measure:	2021 and 2022

Source: TNA project

1.1.3.7 TAP overview table – Biomass for Power Generation

The overview of the TAP for biomass for electricity generation is given in **Table 22**.

Table 22. TAP overview table for Biomass Power Generation.

Sector	**Energy**							
Sub-sector	Power generation							
Technology	Biomass for power generation							
Ambition	The target is to generate 5 MW of grid-fed power from the combustion of biomass feedstocks by the end of 2025.							
Benefits	The sustainable development benefits of the TAP are: (1) cumulative direct GHG emission reductions in 2030 of ~119 $ktCO_2$; (2) creation of 61 direct green jobs (combination of construction and implementation, and O&M); and (3) a cumulative avoided cost on energy bill to 2030 of ~US$ 28 million.							
Action	**Activities to be implemented**	**Sources of funding**	**Responsible body and focal point**	**Time frame**	**Risks**	**Success criteria**	**Indicators for Monitoring of implementation**	**Budget per activity**
Action 1: Set up appropriate FiT scheme	Activity 1.1: Appoint an energy economist to develop FiT for waste to energy (and other renewables)	Government (through the SEC)	SEC (with support from MEECC)	Q4-2018 to Q1-2019	Competent Energy Economist will not be attracted	FiT developed and approved	- Appointment of Energy Economist - FiT developed - FiT approved	45,000
	Activity 1.2: Develop model for setting tariffs (electricity and FiTs) with complete transfer of knowledge and expertise to SEC staff	Donor / Development Partner	SEC (with technical support from Energy Economist, and involving MEECC and PUC)	Q1-2019 to Q2-2019	- Modelled tariffs not accepted by all parties - Institution alisation of modelling tool not successful	Model for setting tariffs developed; SEC staff capacitated to carry out tariff modelling	- Tariff setting model developed - Number of SEC staff capacitated	50,000
	Activity 1.3: Set up system to monitor and update tariffs (electricity and FiTs) on a regular basis	Donor / Development Partner	SEC and MEECC	Q2-2019 and 2020	System to update tariffs and FiT is not institutionali sed	System to update tariffs and FiT is operationalised at SEC	- Number of system established - Number of times system is used to update tariffs and FiT	20,000 (per update)
Action 2: Updating the Energy Act 2012 to allow private participation in	Activity 2.1: Update the Energy Act 2012	Donor/ Development partner	MEECC	Q1-2019 to Q3-2019	Resistance to opening the power market to	Energy Act is updated with provision for private sector participation in	Energy Act updated	30, 000 (2019) [*30,000 (2027)*]

the power market					private actors	the power market and feed-in tariffs for renewable energies are scheduled		
	Activity 2.2: Initiative transparent technology bidding process	Donor / Development Partner	Tender Board and SEC	Q1-2024 to Q4-2024	Low institutional capacity for implementing bidding process	Bidding process has been completed with the selection of private partner for the implementation of 5 MW of biomass for power generation by 2025	- Transparent bidding process in place and put into use - Number of responsive bids from potential strategic partners	10,000
Action 3: Institutional strengthening	Activity 3.1: Equip SEC with appropriate tools and software to deliver on duties	Donor/ Development partner	SEC	Q1-2019 to Q2-2019	Lack of absorption capacity at SEC	Technical capacity for modelling tariffs and other financial/economic instruments for the power sector is in place at SEC	Number of staff trained to carry out tariff modelling and to carry out financial/economic analyses	15,000 (linked with Activity 1.2)
	Activity 3.2: Set up support institutions such as an Arbitration Court	Donor/ Development partner	MEECC and SEC [Focal pt: Department of Legal Affairs]	Q4-2019 to Q2-2021	Lack of political support for setting up court	Arbitration Court is set up and operational by Q2-2021	Arbitration Court established	15,000 (does not cover the cost of staffing since this is expected to be covered through government recurrent budget)
	Activity 3.3: Establishing transparent tendering procedures and standardised PPA documents	Donor/ Development partner	SEC [Focal pt: Department of Legal Affairs]	Q1-2019 to Q3-2019	Resistance to establish a transparent tendering process	Tendering process has been established and used to select most appropriate strategic private	- Number of procedures and standardised documents developed - Number of private bidders that have	15,000

						partner by Q4-2019	used the tendering process - Feedback from bidders regarding the bidding process	
	Activity 3.4: Carry out detailed stakeholder mapping for all actors involved in biomass for power generation, and define roles and responsibilities	Government	MEECC, SEC, SNPA and SAA	Q3-2019 to Q1-2020	Low institutional commitment of stakeholders	Institutional mapping completed and roles and responsibilities of stakeholders have been defined and endorsed	- Number of institutional stakeholders participating in mapping process - Endorsement of stakeholder roles and responsibilities	10,000
	Activity 3.5: Set up a multi-stakeholder committee to enhance stakeholder coordination and provide oversight of technology implementation	Government	SEC	Q2-2020 to Q4-2020	Lack of participation from key institutional stakeholders	Multi-stakeholder committee set up and operationalised through regular meetings	- Number of institutional members participating in committee (derived from mapping carried out under Activity 3.4) - Number of meetings and key decisions taken to promote biomass for power generation technology	2,500
Action 4: Skills enhancement in biomass for power generation	Activity 4.1: Prepare curriculum and technical material for teaching	Government (in-kind)	SIT and Ministry of Education	Q1-2021 to Q4-2021	Low interest from SIT to develop course	MOU signed between SIT and SEC/PUC, and training course is developed	- Number of MOU signed - Number of courses developed	3,000
	Activity 4.2: Train the trainers	Government (in-kind)	SIT	Q1-2022 to Q1-2023	Low participation from potential trainers due to lack of interest	At least 4 trainers at SIT trained on delivering course developed under Activity 4.1	- Number of trainers trained	5,000
	Activity 4.3: Acquire materials and equipment for training	Donor/ Development partner	SIT	Q1-2019 to Q2-2021	Lack of local demand for training	Sufficient number of technicians trained in	- Number of technicians trained on thermal	100,000

						biomass combustion technologies for power generation	generation using biomass feedstocks - Number and type of equipment purchased	
Action 5: Biomass resources characterisation	Activity 5.1: Prepare ToR and hire consultant for carrying out an assessment of biomass resources	Government (in-kind)	MEECC, MFA, SAA, MHILT and SNPA	Q1-2021-Q3-2021	Low quality ToR results in the recruitment of low profile services provider	High calibre services provider is recruited	- ToR developed - Recruitment of service provider completed	1,500
	Activity 5.2: Carry out biomass resources assessment and produce final report	Donor/ Development partner	SAA, SNPA, and MHILT	Q4-2021 to Q4-2022	Necessary technical expertise to carry out biomass resources assessment not available	High quality biomass resources assessments completed on three populated islands	Report contained data for 12 months on characteristics of biomass resources on Mahé, La Digue and Praslin	125,000

Source: TNA project

1.2. Project Ideas for Power Sector

This section presents project ideas (PIs) that contain quick win actions that support the realisation of the overall targets indicated in the three TAPs discussed above. Before presenting the PIs in section 1.2.2, the following section provides a discussion of how the PIs were identified and developed, and how they can contribute to the transfer, diffusion, and deployment targets of relevant mitigation/adaptation technologies.

1.2.1 Brief summary of the Project Ideas for Power Sector

The TAPs described in this document are designed with specific Actions and Activities in mind that are interrelated and will together contribute to the successful achievement of the proposed technology targets. While all Activities and Actions would need to be implemented in order to achieve the ambitions set in the TAPs, there are nevertheless 'low-hanging fruits' that can be achieved in terms of taking strides towards achieving the final technology targets. Therefore, a selected set of Activities presented in the TAPs have been retained for fast-tracking technology implementation. The PIs presented in section 1.2.2, therefore, provide 'must-haves' in order to achieve the proposed technology targets.

The rationale for selecting the Activities or Actions comprising the PIs is based on immediate urgency of action that has been defined here as consisting of two elements, namely: (1) the capacity to create an enabling environment that is supportive of the implementation of the other Actions/Activities proposed in the TAPs, and that are also supportive of the uptake of several mitigation technologies in the power sector, and (2) the necessity to provide basic technology-specific data that are required to support the final choice of technology, as well as allowing project proponents to develop meaningful business or financial proposals for justifying capital investments (using high upfront capital costs). Since the PIs cover issues related to creating the necessary enabling environment needed to achieve technology targets, the common elements of an enabling environment that cuts across several technologies have not been discussed separately.

Three PIs have been proposed for the power sector based on the discussions under the sections above on 'Actions to be selected as Project Ideas'. They are:

4. **Project Idea 1 - Multi-technology enabling environment:** All proposed mitigation technologies are expected to be implemented by a private partner. In this respect, the Energy Act 2012 will need to be updated in order to allow private participation in power generation in Seychelles. Further, the SEC needs institutional strengthening in order to allow it to better play its role as a regulator for promoting the mitigation technologies;
5. **Project Idea 2 - Technical assessments as technology enablers:** The implementation of all three technologies reply on studies that will demonstrate technical feasibility. In the cases of waste-to-energy and biomass for power generation requires detailed characterisation of resources in solid waste and biomass feedstocks are needed. Such data are needed for private proponents to finalise their business models. For waste-heat-recovery, a techno-economic feasibility study is proposed; and
6. **Project Idea 3 - Feed-in-Tariffs for renewable energies:** The TAPs for waste-to-energy and biomass for power generation have proposed the adoption of FiTs as a means of overcoming financial barriers. FiTs also provide potential investors with long-term financial visibility regarding their proposed business models, especially for renewable energies that have relatively high upfront capital costs.

1.2.2 Specific Project Ideas

The PIs draw from the TAPs summarised in **Table 8**, **Table 15** and **Table 22**. The PIs are summarised in **Table 23**, **Table 24** and **Table 25**.

Table 23. Project Idea 1 - Multi-technology enabling environment.

Introduction/ Background	Updating the Energy Act 2012 in order to allow private sector participation in power generation in Seychelles was an enabling condition common across all three TAPs. Similarly, institutional strengthening of the SEC is common to all three mitigation

<table>
<tr><td></td><td>technologies. Together, updating the legal and regulatory frameworks and institutional strengthening of the energy regulator are expected to provide the enabling conditions for achieving the technology targets. Interestingly, the enabling conditions will also favour other renewable energy sources.</td></tr>
<tr><td>Objectives</td><td>1. To update the Energy Act 2012 to allow participation of private power producers in the power sector
2. To enhance the capacity of the SEC to play its role as an independent regulator in the context of promoting technologies that have been identified</td></tr>
<tr><td>What are the outputs and are they measurable?</td><td>All the outputs are measurable as indicated by objectively verifiable indicators in the TAPs. The main outputs are:
1. Energy Act 2012 has been updated to allow private operators in power generation
2. Transparent bidding process is in place using standardised process and documents, and tenders launched and proposals received
3. Selected staff of SEC have participated in study tours and new competencies have been used to reinforce institutional processes and mechanisms to support TAPs implementation</td></tr>
<tr><td>Relationship to the country’s sustainable development priorities</td><td>The Government of Seychelles has submitted its Nationally Determined Contribution (NDC) to the UNFCCC, and NDC is also supportive of SDG13. Facilitated by the proposed PI, the TAPs can be used to inform the post-2018 dialogues planned under the ‘ratchet mechanism’[5] to increase the ambition of the mitigation targets that were proposed in the NDC. As such, the PI can play a significant role in the review process of the first NDC.</td></tr>
<tr><td>Project Deliverables e.g. Value/Benefits/Messages</td><td>1. Private sector participation in the power sector can be a productive (efficient and effective) means of increasing and diversifying investments in power generation
2. A stronger and more mature energy regulator decreases overall risks in investments in the power sector</td></tr>
<tr><td>Project Scope and Possible Implementation</td><td>The project is narrowly focused in order to increase its chances of success. It builds on the recognition that a monopolistic situation in the power sector is not ideal for the medium-to-long term sustainability of the power sector. Further, the PI will build on past and existing efforts to enhance the institutional capacity of the SEC.</td></tr>
<tr><td>Project activities</td><td>The activities are taken directly from the TAPs in order to show the coherence between TAPs and PIs:
1. Update the Energy Act 2012 to allow private sector participation in the power market
2. Establishing transparent tendering procedures and standardised PPA documents
3. Training for 2 SEC staff to assume regulator role through study tours</td></tr>
<tr><td>Timelines</td><td>By virtue of being quick wins, the activities are expected to be carried out between 2018 and 2020 (or 2 years within start of implementation)</td></tr>
<tr><td>Budget/Resource requirements (What is the budget? How is the project to be funded? /Staff, Engaging consultants, partnership, etc.)</td><td>
<table>
<tr><th>Activity</th><th>Budget (US$)</th><th>Means of implementation</th></tr>
<tr><td>Updating Energy Act</td><td>30,000 (2019)
[30,000 (2027)]</td><td>Consultants with support from MEECC staff</td></tr>
<tr><td>Tendering process</td><td>15,000</td><td>Consultants with support from SEC staff</td></tr>
<tr><td>Study tours</td><td>8,000 (2019)

[8,000 in each of 2022, 2025 and 2028)</td><td>SEC staff</td></tr>
</table>
</td></tr>
<tr><td>Measurement/ Evaluation (What tangible evaluation of accomplishments will be conducted? How will the</td><td>
<table>
<tr><th>Activity</th><th>M&E Indicators</th><th>Sources of verification</th></tr>
<tr><td>Updating Energy Act</td><td>Updated Energy Act</td><td>Government Gazette</td></tr>
<tr><td>Tendering process</td><td>- Number of procedures and standardised documents developed
- Number of private bidders that have used the tendering process</td><td>Project M&E reports</td></tr>
</table>
</td></tr>
</table>

[5] https://www.carbonbrief.org/timeline-the-paris-agreements-ratchet-mechanism - accessed 8 May 2018.

success be measured?)		- Feedback from bidders regarding the bidding process	
	Study tours	Number of SEC staff trained and supporting TAP implementation	Project M&E reports
Possible Complications/ Challenges	**Activity**	**Challenges**	
	Updating Energy Act	Resistance to opening the power market to private actors by incumbent	
	Tendering process	Resistance to support establishment of a transparent tendering process by incumbent	
	Study tours	Lack of absorption capacity of SEC	
Responsibilities and Coordination	Having the mandate for policy making in the energy sector, the MEECC will be responsible for updating the Energy Act 2012, as well as for coordinating the stakeholder during the review process. All activities related to the institutional strengthening of the SEC will be the responsibility of the SEC. It will also carry out coordination of stakeholders for the setting up of a transparent bidding process and procedures. If necessary, coordination can be supported by the MEECC.		

Source: TNA project

Table 24. Project Idea 2 - Technical assessments as technology enablers.

Introduction/ Background	The implementation of all three technologies reply on studies that will demonstrate technical feasibility. In the cases of waste-to-energy and biomass for power generation requires detailed characterisation of resources in solid waste and biomass feedstocks are needed. Such data are needed for private proponents to finalise their business models. For waste-heat-recovery, a techno-economic feasibility study is proposed.
Objectives	1. To carry out a techno-economic study for waste heat recovery at Roche Caiman power station 2. To carry out detailed solid waste characterisation on the three main populated islands of Seychelles to ascertain the quantity and quality of solid waste that can be used for anaerobic digestion 3. To carry out a detailed assessment of biomass resources that can be used as feedstock for power generation
What are the outputs and are they measurable?	All the outputs are measurable as indicated by objectively verifiable indicators in the TAPs. The main outputs are: 1. High quality techno-economic study on waste heat recovery for power generation at Roche Caiman station completed and approved by stakeholders 2. High quality solid waste characterisation completed on three populated islands and approved by stakeholders 3. High quality biomass resources assessments completed on three populated islands and approved by stakeholders
Relationship to the country's sustainable development priorities	The Government of Seychelles has submitted its Nationally Determined Contribution (NDC) to the UNFCCC, and NDC is also supportive of SDG13. Facilitated by the proposed PI, the TAPs can be used to inform the post-2018 dialogues planned under the 'ratchet mechanism'[6] to increase the ambition of the mitigation targets that were proposed in the NDC. As such, the PI can play a significant role in the review process of the first NDC.
Project Deliverables e.g. Value/Benefits/Messages	1. An evidence-based approach is used to justify investments in mitigation technologies that support energy efficiency and renewable energy sources in power generation 2. Catalysing investments in the power sector by increasing the market visibility for potential investors 3. Enhancing data quality on resources (waste heat, solid waste and biomass feedstocks) that can be used for alternative uses to support policy decision-making

[6] https://www.carbonbrief.org/timeline-the-paris-agreements-ratchet-mechanism - accessed 8 May 2018.

<table>
<tr><td></td><td>4. Enhancing human and institutional capacity for carrying out technical studies</td></tr>
<tr><td>Project Scope and Possible Implementation</td><td>The project is narrowly focused in order to increase its chances of success. It builds on the recognition that there is currently a lack of technical data on resources (waste heat that can be recovered, solid waste that can be anaerobically digested, and renewable biomass feedstocks that can be combusted) needed to implement proposed mitigation technologies. Although, the proposed resources assessments require skills and expertise that are not available in Seychelles, they nevertheless are standard assessments that can be completed through the procurement of consultancy services.</td></tr>
<tr><td>Project activities</td><td>The activities are taken directly from the TAPs in order to show the coherence between TAPs and PIs:
1. Prepare ToR and hire consultants for carrying out an assessment of resources needed to implement mitigation technologies (waste heat that can be recovered, solid waste that can be anaerobically digested, and renewable biomass feedstocks that can be combusted)
2. Carry out techno-economic feasibility studies on waste heat recovery at Roche Caiman power station
3. Carry out solid waste characterisation on Mahé, La Digue and Praslin
4. Carry out biomass resources assessment and produce final report</td></tr>
<tr><td>Timelines</td><td>According to TAPs: (1) techno-economic studies for waste heat recovery will be carried out in 2018 and 2019; (2) solid waste characterisation will be carried out in 2021; and (3) the assessment of biomass resources will be carried out in 2022.</td></tr>
<tr><td>Budget/Resource requirements (What is the budget? How is the project to be funded? /Staff, Engaging consultants, partnership, etc.)</td><td>
<table>
<tr><th>Activity</th><th>Budget (US$)</th><th>Means of implementation</th></tr>
<tr><td>Prepare ToRs and recruit consultants</td><td>8,000</td><td>Staff</td></tr>
<tr><td>Techno-economic study for waste heat recovery</td><td>125,000</td><td>Consultancy services</td></tr>
<tr><td>Solid waste characterisation</td><td>75,000</td><td>Consultancy services</td></tr>
<tr><td>Characterisation of biomass resources</td><td>125,000</td><td>Consultancy services</td></tr>
</table>
</td></tr>
<tr><td>Measurement/ Evaluation (What tangible evaluation of accomplishments will be conducted? How will the success be measured?)</td><td>
<table>
<tr><th>Activity</th><th>M&E Indicators</th><th>Sources of verification</th></tr>
<tr><td>Prepare ToRs and recruit consultants</td><td>- Number of ToRs approved
- Number of consultants recruited</td><td>Project M&E reports</td></tr>
<tr><td>Techno-economic study for waste heat recovery</td><td>Feasibility study report</td><td>Technical report; project M&E reports</td></tr>
<tr><td>Solid waste characterisation</td><td>Report containing data for 12 months on characteristics of biomass resources on Mahé, La Digue and Praslin</td><td>Technical report; project M&E reports</td></tr>
<tr><td>Characterisation of biomass resources</td><td>Report containing GIS-based data on renewable biomass feedstocks on Mahé, La Digue and Praslin</td><td>Technical report; project M&E reports</td></tr>
</table>
</td></tr>
<tr><td>Possible Complications/ Challenges</td><td>
<table>
<tr><th>Activity</th><th>Challenges</th></tr>
<tr><td>Prepare ToRs and recruit consultants</td><td>Low quality ToR results in the recruitment of low profile services providers</td></tr>
<tr><td>Techno-economic study for waste heat recovery</td><td>Poor quality of studies because competent Transaction Adviser could not be attracted</td></tr>
<tr><td>Solid waste characterisation</td><td>Necessary technical expertise to carry out solid waste characterization is not attracted</td></tr>
<tr><td>Characterisation of biomass resources</td><td>Necessary technical expertise to carry out biomass resources assessment not attracted</td></tr>
</table>
</td></tr>
<tr><td>Responsibilities and Coordination</td><td>The responsibilities for carrying out the activities will rest with the competent, mandated institutions. The techno-economic feasibility study on waste heat recovery will be coordinated by the SEC with support from the PUC. The characterisation of municipal solid waste will be under the responsibility of the LWMA, while the responsibility for the assessment of biomass resources will rest with the SNPA, SAA and MHILT.</td></tr>
</table>

Source: TNA project

Table 25. Project Idea 3 - Feed-in-Tariffs for renewable energies.

<table>
<tr><td>Introduction/ Background</td><td>The TAPs for waste-to-energy and biomass for power generation have proposed the adoption of FiTs as a means of overcoming financial barriers. FiTs also provide potential investors with long-term financial visibility regarding their proposed business models, especially for renewable energies that have relatively high upfront capital costs. The proposed project idea offers the potential for including other renewable energy sources that may need a FiT as incentive.</td></tr>
<tr><td>Objectives</td><td>1. To develop model for setting FiTs for renewable energy sources
2. To equip SEC with model tool and human capacity building to revise and update FiTs on a regular basis</td></tr>
<tr><td>What are the outputs and are they measurable?</td><td>All the outputs are measurable as indicated by objectively verifiable indicators in the TAPs. The main outputs are:
1. Model for setting tariffs (electricity and FiTs) with complete transfer of knowledge and expertise to SEC staff
2. System to monitor and update tariffs (electricity and FiTs) on a regular basis</td></tr>
<tr><td>Relationship to the country's sustainable development priorities</td><td>The Government of Seychelles has submitted its Nationally Determined Contribution (NDC) to the UNFCCC, and NDC is also supportive of SDG13. Facilitated by the proposed PI, the TAPs can be used to inform the post-2018 dialogues planned under the 'ratchet mechanism'[7] to increase the ambition of the mitigation targets that were proposed in the NDC. As such, the PI can play a significant role in the review process of the first NDC.</td></tr>
<tr><td>Project Deliverables e.g. Value/Benefits/Messages</td><td>1. An evidence-based approach is used to set tariffs for different sources of renewable energy sources
2. Catalysing investments in the power sector by increasing the market visibility for potential investors
3. Enhancing human and institutional capacity for carrying out technical studies to inform the setting up of FiTs</td></tr>
<tr><td>Project Scope and Possible Implementation</td><td>The project is narrowly focused in order to increase its chances of success. It builds on the recognition that there is currently a lack of methodology for modelling FiTs. Also, there is a lack of mechanism for revising and updating FiTs on a regular basis. The capacity building will be supported through the recruitment of a high calibre Energy Economist. The human capacity building will employ existing SEC staff.</td></tr>
<tr><td>Project activities</td><td>The activities are taken directly from the TAPs in order to show the coherence between TAPs and PIs:
1. Appoint an energy economist to develop FiT for waste to energy and biomass for power generation (and other renewables)
2. Develop model for setting tariffs (electricity and FiTs) with complete transfer of knowledge and expertise to SEC staff
3. Set up system to monitor and update tariffs (electricity and FiTs) on a regular basis
4. Equip SEC with appropriate tools and software to deliver on duties</td></tr>
<tr><td>Timelines</td><td>According to TAPs, the proposed project activities will be carried out between Q4-2018 and 2020.</td></tr>
<tr><td>Budget/Resource requirements (What is the budget? How is the project to be funded? /Staff, Engaging consultants, partnership, etc.)</td><td>
<table>
<tr><th>Activity</th><th>Budget (US$)</th><th>Means of implementation</th></tr>
<tr><td>Appoint Energy Economist</td><td>45,000</td><td>Consultancy services</td></tr>
<tr><td>Develop model for FiTs</td><td>50,000</td><td>Consultancy services</td></tr>
<tr><td>Set up tariff monitoring system</td><td>20,000 / update</td><td>Consultancy services</td></tr>
<tr><td>Equipping SEC with tools</td><td>15,000</td><td>Consultancy services</td></tr>
</table>
</td></tr>
<tr><td>Measurement/ Evaluation (What tangible evaluation of</td><td>
<table>
<tr><th>Activity</th><th>M&E Indicators</th><th>Sources of verification</th></tr>
<tr><td>Appoint Energy Economist</td><td>- Appointment of Energy Economist
- FiT developed
- FiT approved</td><td>Project M&E reports</td></tr>
</table>
</td></tr>
</table>

[7] https://www.carbonbrief.org/timeline-the-paris-agreements-ratchet-mechanism - accessed 8 May 2018.

accomplishments will be conducted? How will the success be measured?)	Develop model for FiTs	Tariff setting model developed	Technical report; project M&E reports	
	Set up tariff monitoring system	- Number of system established - Number of times system is used to update tariffs and FiT	Project M&E reports	
	Equipping SEC with tools	Number of SEC staff capacitated	Technical report; project M&E reports	

Possible Complications/ Challenges	**Activity**	**Challenges**
	Appoint Energy Economist	Inability to attract high calibre Energy Economist
	Develop model for FiTs	Modelled tariffs not accepted by all parties
	Set up tariff monitoring system	System to update tariffs and FiT is not institutionalised or operationalised after capacity transfer
	Equipping SEC with tools	Lack of absorption capacity at SEC
Responsibilities and Coordination	All the activities will be under the responsibility of the SEC. The SEC will also be tasked for coordinating all stakeholders.	

Source: TNA project

Chapter 2 Technology Action Plan and Project Ideas for Land Transport

2.1. TAP for Land Transport

2.1.1. Sector Overview

Land transport is the second largest GHG emitting sub-sector in Seychelles (Government of Seychelles, 2017b). According to the Energy Policy 2010 (Van Vreden et al., 2010) energy use in the transport sub-sector can be reduced by 15-30% (or even more) by 2030 (**Table 26**). Projections have been made in the SNC regarding the increase in baseline emissions from road transport sector from 66,525 tCO_2 in 2005 to 167,087 tCO_2 in 2030. The projections correspond to an increase in the number of vehicles from 10,622 in 2005 to 20,000 in 2030. Fossil fuel consumption is expected to increase from 21,324 tonnes (2005) to 53,620 tonnes in 2030. **Table 26** summarises the baseline emissions and emission reductions up to 2030 for transport taken from the SNC (Government of Seychelles, 2011) and INDC (Government of Seychelles, 2015). The numbers in brackets show the equivalent percentage reduction relative to the baseline emissions. The revised emission reductions used in the INDC reveals the difficulties in mitigating emissions in the transport sector. Nevertheless, the data shows the significant opportunities for emission reductions in the land transport sub-sector in Seychelles.

Table 26. Emission reduction in the transport sector, tCO_2.

Year	2010	2015	2020	2025	2030
Baseline emissions (tCO_2)	80,754	96,390	117,310	139,998	167,087
Emission reductions (SNC)	4,038 (5%)	9,639 (10%)	23,462 (20%)	34,999 (25%)	41,772 (25%)
Emission reductions (INDC)	0 (0%)	0 (0%)	5,865 (5%)	25,200 (18%)	50,126 (30%)

Source: Government of Seychelles, 2011b and MWH and Expertise France, 2015

A total of six short-listed mitigation technologies in the land transport sub-sector were prioritised using multi-criteria analysis (Government of Seychelles, 2017a). Three technologies were prioritised for detailed barriers and enabling framework analysis, and for subsequently developing technology action plans (TAPs) (Government of Seychelles, 2017b):

1. **Low-carbon (private) car fleet:** While transport is the second largest emitting sub-sector in Seychelles, approximately 77% of this emission emanates from road transport. Further, more than two-thirds of all motorised vehicles are privately-owned cars (Government of Seychelles, 2017). Except for few hybrid and electric cars, the overwhelming majority of the cars have internal combustion engines burning gasoline and diesel. The proposed mitigation technologies are for the higher penetration of hybrid and electric cars. By 2030, 70% and 10% of the total car fleet are expected to be hybrid or electric vehicles, respectively.

2. **Victoria Traffic Management Plan (VTMP):** Congestion is a major issue across Seychelles, and particularly in Victoria, where bus journey times and reliability are significantly impacted. The VTMP proposes a host of actions to remedy this problem, such as extending road networks and relocation of the central bus terminal in Victoria. The detailed interventions comprising the VTMP as discussed in section 2.1.3. The overall result is expected to be a 5% reduction in national fuel consumption by 2030.

3. **Electric scooters:** Electric scooters can be used along the flat regions of the granitic islands, for commuting in Victoria, as well as for commuting along the routes used by electric buses. It is assumed that the electric scooters (e-scooters) would be an alternative to motorcycles, and the penetration is planned to be 1,500 by 2030.

2.1.2. Action Plan for Low-Carbon Car Fleet

2.1.2.1 Introduction

There exist two major technical pathways to GHG emission reductions. The first pathway involves the deployment of alternative, lower carbon fuels like biofuels, liquefied petroleum gas (LPG), or natural gas (compressed or liquefied). The second technical pathway involves the improvement of the energy efficiency of the vehicles through downsizing of the engine and various levels of hybridization and electrification. These two technical pathways are complementary.

The most energy efficient and lowest carbon emission vehicle available today is the electric vehicle charged with solar PV. However, commercialization of full electric vehicles is still hampered by high purchase prices (storage systems), short driving ranges and relatively long recharging times. An alternative to these shortcomings can be found in a hybrid vehicle that combines an internal combustion engine with technologies used in full electric vehicles.

The TAP for low-carbon private car fleet will build on the experience in deploying hybrid and electric cars in Seychelles. As discussed in the TNA Report – Mitigation (Government of Seychelles, 2017; Table 22), there were approximately 300 hybrid and 18 electric cars in Seychelles in 2015. The introduction of these low-carbon road transport technologies started as a consequence of government providing financial incentives in the form of reduced the taxes and duties on all electric and hybrid vehicles. Hybrid and electric cars offer numerous advantages compared to conventional technologies, such as (Government of Seychelles, 2017a, 2017b): (1) direct GHG emission reductions in 2030 of ~12.5 $ktCO_2$ per year; and (2) an avoided cost on energy bill in 2030 of ~US$ 2.8 million. Because of the small size of Seychelles, land is a valuable and expensive commodity. Another benefit of the technology is that it does not entail incremental land use compared to conventional cars.

2.1.2.2 Ambition for the TAP

By 2030, 70% and 10% of the total car fleet are hybrid or electric vehicles, respectively. In absolute terms, these targets represent an increment of 2,423 electric and 16,785 hybrid cars over the 2015 baseline.

2.1.2.3 Actions and Activities selected for inclusion in the TAP

This section provides a discussion of the Actions and Activities that have been selected to inclusion in the TAP for Low Carbon Car fleet. The Actions are linked to the measures that were identified following detailed analyses of barriers facing the technology (Government of Seychelles, 2017b), as well as the enabling environment required to promote the technology. A programmatic approach is used to justify the formulation of TAP. While the technology transfer will rest on the implementation of all Actions, Project Ideas (PIs) have been proposed to start the technology transfer process by focusing on Actions and Activities of immediate urgency and those presenting low-hanging fruits. As far as practicable, the PIs would support enabling conditions for promoting multiple mitigation technologies simultaneously.

Summary of barriers and measures to overcome barriers

Table 27 provides a summary of the barriers and measures identified for Low carbon car fleet.

Table 27. Overview of barriers and measures to overcome these for Low Carbon Car Fleet.

Categories	Identified barriers	Measures to overcome barriers
Economic and financial	High cost of technology	- 1.5% and 4% subsidy on loan interest for hybrid and electric cars, respectively
Regulatory	• Lack of after sale service • Battery disposal	Establishing of a legal framework so that only authorised dealers are able to import low-carbon vehicles in the country
Policy	Lack of policy for promoting low-carbon motorised vehicles	Formulating policies for promoting low-carbon motorised vehicles

Human skills	Lack of local experts to maintain the low carbon car fleet	Training technicians for providing specialised technical services to owners of hybrid and electric vehicles

Source: Government of Seychelles, 2017b

Actions selected for inclusion in the TAP (Low Carbon Car Fleet)

The measures for inclusion in the TAP for Low Carbon Car Fleet were derived from the BAEF Report (Government of Seychelles, 2017b). The rationale for selecting measures for inclusion as Actions in the TAP is the same as that used for the power sector (section 1.1.2). The technology targets are predicated on the assumption that all the measures will be implemented simultaneously. Consequently, all the identified measures are ranked as medium to high in terms of urgency. Only when a measure is being covered by an existing initiative, has the urgency of that measure been ranked as low.

Table 28 provides an assessment of the measures considered for inclusion in the TAP for Low Carbon Car Fleet. Because of their medium-to-high urgency, all the measures have been retained as Actions for the Low Carbon Car Fleet TAP. The measures are grouped by category of barriers.

Table 28. Assessment of measures for Low Carbon Car Fleet.

Measures to overcome barriers	Assessment	Ranking
Financial & Economic Barriers A subsidy on loan interest for hybrid and electric cars	The market conditions is mostly ready to accommodate these new technologies on the roads at the fast pace. A lower interest rate financing mechanism or a special financial scheme will make the technology more affordable and attractive. Compared to conventional cars (typically of engine capacity less than 1.5 L), electric vehicles still remain financially unattractive. The price difference is less pronounced for hybrid cars. Consequently, it is proposed that a rebate of 1.5% and 4% subsidy on interest rates for incremental loans to purchase hybrid and electric cars, respectively, be provided to buyers. The approach here is to only give a rebate on the interest rate for the price differential between a low-carbon car and a conventional car. The motivation for this is that the financial measure should not generally promote private car ownership (regardless of GHG emissions) at the expense of more sustainable forms of mobility such as public transport. This is especially important in the case of Seychelles that has limited space for additional road infrastructure development. The cost of the financial measure is the cost of providing these concessions on loans.	high
Regulatory Barriers The establishing of a legal framework so that only authorised dealers are able to import low-carbon vehicles in the country	Most of the hybrid and electric cars sold in the country are not being done through authorised dealers. This has a detrimental impact on the customer confidence and acceptability because of worries related to after sales service and availability of spare parts. A regulated market where legal dealership only can operate will increase consumer confidence and acceptability of low-carbon options.	high
Policy Barrier Formulating policies for promoting low-carbon motorised vehicles	There is a lack of coherent policy to promote electric vehicles in general. The ministry responsible for land transport and its associated agencies should draft policies that would guide the uptake of low-carbon motorised vehicles. *There is already a proposal to draft policies for promoting low-carbon cars*.	Low
Human Capacity Barrier Training technicians for providing specialised technical services to owners of hybrid and electric vehicles	There are currently none or limited trained and qualified local experts to maintain and repair the low carbon car fleet. Cars with electric drives pose real threats of electrocution or fire hazards when not handled by appropriately trained and accredited technicians. One of the enabling market	Medium

Measures to overcome barriers	Assessment	Ranking
	conditions is to train technicians for providing specialised technical services to owners of hybrid and electric vehicles. The measure will consist of developing a new course and to have it accredited by the Ministry of Education. The measure will support acceptance of the technologies and boost consumer confidence to invest in hybrid and electric cars.	

Source: TNA project

Activities identified for implementation of selected Actions

Three Actions (based on the measures identified with medium or high urgency in **Table 28**) have been retained for inclusion in the TAP for Low Carbon Car Fleet, and their accompanying Activities are listed in **Table 29**.

Table 29. Summary of Actions for Low Carbon Car Fleet TAP and their corresponding Activities.

Summary of Actions	
Action 1:	**A subsidy on loan interest for hybrid and electric cars**
Action 2:	**Establish authorised dealership for low carbon cars**
Action 3:	**Training of qualified technicians carry out repairs and maintenance**
Activities for Action implementation	
Action 1: A subsidy on loan interest for hybrid and electric cars	
Activity 1.1	Hire a consultant to develop the subsidy scheme in consultation with all stakeholders
Activity 1.2	Seek formal approval of subsidy scheme in order to initiate implementation
Activity 1.3	Capacity building of the Department of Land Transport to review and update subsidy scheme
Activity 1.4	Establish multi-stakeholder working group to carry out long term monitoring of the subsidies and ensure elimination of economic losses
Action 2: Establish authorised dealership for low carbon cars	
Activity 2.1	Draft and approve strategy and guidelines for low carbon vehicle dealership
Activity 2.2	Carry out capacity building of car dealers on the strategy and guidelines
Activity 2.3	Set up committee to oversee the development of the market for low-carbon cars
Action 3: Training of qualified technicians to carry out repairs and maintenance	
Activity 3.1	Hire consultant to carry out training needs assessment
Activity 3.2	Establish MOU with SIT for delivery of accredited training (through a certification programme)
Activity 3.3	Develop technical training programme for electric vehicles

Source: TNA project

Actions to be selected as Project Ideas

While recognising that all the Actions and Activities presented in **Table 29** need to be implemented to achieve the tehnology target, a Project Idea (PI) is proposed to implement Actions/Activities of immediate urgency and those that promote the enabling environment across multiple technologies. Consequently, the following Actions/Activities are proposed as PI for Low Carbon Car Fleet:

- Action 1: The necessity of Actions 2 and 3 is felt most when there is market demand for the proposed technology options (hybrid and electric cars). Stimulating market demand is therefore a priority, and it is proposed to be driven through subsidies on loan interest. Consequentlty, Activities 1.1 and 1.2 will form part of the PI for Low Carbon Car Fleet. It is pointed out that the 'formal approval'of the subsidy scheme implies, firstly, that the subsidy scheme is adopted as a formal government policy instrument, and, secondly, that agreements have been reached with local financial institutions to apply the subsidy scheme; and
- Action 2: Activity 2.1 is included since it can also be used to promote other low-carbon technologies such as e-scooters; and

- Action 3: A quick-win is to establish a formal agreement with SIT at an early stage for delivering accredited training on the repair and maintenance of low-carbon motorised vehicles.

2.1.2.4 Stakeholders and Timeline for implementation of TAP

This section identifies the stakeholders who will be responsible to implement the TAP, and their roles in the process are defined. It also gives the sequence and timing of each Activity.

Overview of Stakeholders

The Action-specific roles of the main stakeholders in the implementation of the TAP for Low Carbon Car Fleet are given in **Table 30**. The list of also contains stakeholders whose identities are currently unknown – i.e. they will be recruited or appointed during TAP implementation, but whose roles are well defined. In these cases, and where possible and practicable, potential stakeholders are identified to guide further action.

Table 30. Roles of stakeholders involved in the implementation of the Low Carbon Car Fleet TAP.

Key Stakeholders	Role
Department of Land Transport (DoLT) (Actions 1, 2 and 3)	The DoLT is the parent department in charge of formulating policies for the transport sector, as well as overseeing the development of policy instruments such as legislation and institutional arrangements in order to implement the policies. DoLT will not be a direct beneficiary, but it will be one of the key facilitators for all the Actions.
Road Transport Commission (RTC) (Actions 1 and 2)	The RTC, in collaboration with the DoLT, is responsible for regulating the number of vehicles, their usage, and road worthiness standards to ensure road safety, with the collaboration of the Traffic Section of the Police and they also help Ministry of Home Affairs and Transport to control vehicular pollution. The RTC will be directly responsible for supervising and assisting in the implementation of the actions that will impact on policies, especially where new policies will need to be drafted and policy instruments developed and operationalised
Ministry of Finance, Trade and Economic Planning (MFTEP) (Action 1)	MFTEP is the mandated public institutions to negotiate and contract government-guaranteed loans in Seychelles. Consequently, the ministry will be closely involved in all Activities pertaining to Action 1, coordinating potential financial policies and mechanisms and working with financial institutions to ensure the best possible option is made available to the consumers.
Seychelles Motor Vehicle Dealers Association (SMVDA) (Actions 1, 2 and 3)	The SMVDA is the private sector body that regroups the official dealers of new vehicles that are imported into Seychelles. Members of the SMVDA are already importing and selling hybrid and electric vehicles in Seychelles, and will comprise the cohort of legal dealers for low-carbon cars in Seychelles. They will be involved in all three Actions.
Seychelles Institute of Technology (SIT) (Action 3)	The SIT is the institution mandate to provide both certificate courses and in service training related to human technical capacity building on the mitigation technologies proposed in the TAP for Low Carbon Car Fleet. The RTC and DoLT will work in collaboration with SIT to develop the necessary accredited courses on the maintenance and repairs of low-carbon vehicles. Given the constrain of the limited pool of human capital, it is proposed that the focus of human capacity building should be on in-service technicians, as these would be in a better position to occupy this market position.
Financial Institutions (local retail banks) (Action 1)	One of the main objectives of Action 1 is to identify local banks or similar financial institutions that will be willing to participate in proposed subsidy scheme to promote low-carbon vehicles, such as hybrid and electric cars.

Source: TNA project

Scheduling and sequencing of specific activities

A detailed timetable for the activities can be found in the planning table below (**Table 31**). The TAP for Low Carbon Car Fleet is planned for implementation between 2019 and 2020. However, for the actions envisioned under this TAP the sequencing would be approximately as follows:

Action 1: A subsidy on loan interest for hybrid and electric cars – This will catalyse the uptake of the technology, and, as an urgent measure, it is planned for implementation early in the TAP lifetime – i.e. 2019. While the scheme will be set up upfront, its monitoring and review (Activity 1.3) will probably span most of the target period – i.e. 2030. The thinking is that the subsidy scheme has to be monitored to avoid unnecessary economic losses as the prices of low-carbon car technologies decrease with increasing market penetration and technology maturity;

Action 2: Establish authorised dealership for low carbon cars – While necessary to create the enabling conditions for the medium-to-long term acceptability of the proposed technology options, it is not of immediate concern. It will be implemented in 2020; and

Action 3: Training of qualified technicians to carry out repairs and maintenance –The activities will be initiated in year 2 (2019), with accredited trainings delivered in 2020.

2.1.2.5 Estimation of Resources Needed for Action and Activities

This section discusses the capacity building elements of the TAP, as well as an estimation of its implementation costs.

Estimation of capacity building needs

Capacity building is an element that cuts across all the Actions, and is justified from the perspective that human and institutional learning can take place at any moment during TAP implementation. The capacity building (human and institutional) elements of the TAP are:

- Activity 1.3: Capacity building of the Department of Land Transport to review and update subsidy scheme. This will be carried out by the consultant that will be recruited to develop the subsidy scheme under Activity 1.1;
- Activity 2.2: Carry out capacity building of car dealers on the strategy and guidelines; and
- Action 3: Training of qualified technicians to carry out repairs and maintenance (of low carbon vehicles).

Estimations of costs of actions and activities

The cost of each Activity constituting the TAP is provided in **Table 31**. The total cost is estimated at US$ 140,500 that will be funded through a combination of cash/grant and in-kind financing. The in-kind financing is estimated at US$7,500 for Activities 1.2, 1.4, 2.2 and 3.2. Further, government (DoLT and RTC) is expected to contribute US$ 3,000 for implementing Activity 2.2. The long-term contribution of government is expected to be higher for Activity 1.4 (that also covers Activity 2.3) when it is expected that the multi-stakeholder committee will review the market development of the market for low-carbon cars and the subsidy scheme on an annual basis up until required. The annual cost is expected to be US$3,000. Therefore, US$ 133,000 is expected to be funded through the financial support of donors and development partners, including international climate finance sources.

The TAP does not cover the cost of the subsidy scheme. In carrying out the benefit cost analysis of Low Carbon Car Fleet (Government of Seychelles, 2017b), the cumulative cost of the subsidy scheme to 2030 was estimated at ~US$ 16 million. The calculation assumed prices of hybrid and electric cars fixed at 2017 prices, and the subsidy scheme assumed to be implemented to 2030. A more realistic scenario would see falling prices over time, and elimination of the subsidy scheme before 2030.

Table 31. Planning table - characterisation of activities for implementation of actions for Low Carbon Car Fleet.

Action 1:	**A subsidy on loan interest for hybrid and electric cars**									
Activities	**Planning**				**Implementation**				**Costs and funding needs**	
	Start	Complete	Who	Capacity needs	Start	Complete	Who	Capacity needs	Costs (US$)	Who will fund
1.1 Hire a consultant to develop the subsidy scheme in consultation with all stakeholders	Q1-2019	Q1-2019	MFTEP, RTC, DoLT and SEC	Definition of Terms of Reference (ToR)	Q2-2019	Q4-2019	MFTEP and DoLT	None (provided by Services Provider / Consultant)	35,000	Donor / Development Partner
1.2 Seek formal approval of subsidy scheme in order to initiate implementation	Q4-2019	Q4-2019	MFTEP, RTC, DoLT and SEC	None	Q1-2020	Q2-2020	Cabinet of Ministers, Attorney General's Office, MFTEP and DoLT	None	1,500	Government (in-kind contribution)
1.3 Capacity building of the Department of Land Transport to review and update subsidy scheme	Q4-2019	Q4-2019	MFTEP, RTC, DoLT and SEC	None (covered under definition of ToR)	Q1-2020	Q1-2020	MFTEP and DoLT	None (training provided by Services Provider/Consultant)	10,000	Donor / Development Partner
1.4 Establish multi-stakeholder working group to carry out long term monitoring of the subsidies and ensure elimination of economic losses (this committee can	Q4-2019	Q4-2019	MFTEP, RTC, DoLT, SMVDA and SEC [*the multi-stakeholder group can also be the Steering Committee for the TAP implementation*]	Institutional coordination	2019	2021 (*to meet at least once a year after 2021*)	MFTEP, DoLT and SMVDA	None	3,000 (for first review in 2021) [*it is anticipated that there will be an annual review of the subsidy scheme at a cost of*	Government (MFTED and DoLT) (in-kind contribution)

also fulfil the conditions of Activity 2.3)									*US$4,000 per year*)[8]	
Action 2:	**Establish authorised dealership for low carbon cars**									
Activities	**Planning**				**Implementation**				**Costs and funding needs**	
	Start	Complete	Who	Capacity needs	Start	Complete	Who	Capacity needs	Costs (US$)	Who will fund
2.1 Draft and approve strategy and guidelines for low carbon vehicle dealership	Q1-2020	Q1-2020	DoLT and RTC	Understanding the enabling conditions for market development	Q2-2020	Q3-2020	DoLT and RTC	Legal and regulatory frameworks for market development	10,000	Donor/development partner
2.2 Carry out capacity building of car dealers on the strategy and guidelines	Q3-2020	Q4-2020	DoLT, RTC and SMVDA	Institutional coordination	Q4-2020	Q1-2021	DoLT, RTC and SMVDA	Delivery of training	4,000	DoLT and RTC (US$ 3,500 grant) SMVDA (US$1,500 in-kind)[9]
2.3 Set up committee to oversee the development of the market for low-carbon cars (*Uses the structure developed under Activity 1.4*).	Q4-2019	Q4-2019	DoLT, RTC and SMVDA	Institutional coordination	2019	2021 (*to meet at least once a year after 2021*)	DoLT, RTC and SMVDA	None (since the task forms part of the ongoing vehicles park monitoring by institutions)	Covered under budget for Activity 1.4	Covered under budget for Activity 1.4
Action 3:	**Training of qualified technicians to carry out repairs and maintenance**									
Activities	**Planning**				**Implementation**				**Costs and funding needs**	

[8] Please see explanation given in section 2.1.4 that has proposed implementation of the TAP for e-scooters as a subset of the TAP for Low Carbon Car Fleet. The TAP for e-scooters has been budgeted using an incremental costing approach. Hence, there will be an additional US$1,000 in-kind contribution for the annual review of the subsidy scheme for e-scooters.

[9] Total includes an incremental cost of US$1,000 to cover the participation of dealers in e-scooters.

	Start	Complete	Who	Capacity needs	Start	Complete	Who	Capacity needs	Costs (US$)	Who will fund
3.1 Hire consultant to carry out training needs assessment	Q2-2019	Q2-2019	SIT, DoLT and SMVDA	Definition of ToR to attract high calibre consultant	Q3-2019	Q2-2020	SIT, DoLT and SMVDA	Training needs assessment carried out by Services Provider/Consultant	10,000	Donor/development partner
3.2 Establish MOU with SIT for delivery of accredited training	Q3-2019	Q3-2019	DoLT, SMVDA and SIT	Institutional coordination	Q4-2019	Q4-2019	DoLT, SMVDA and SIT	None	1,500	Government (SIT and DoLT) (in-kind contribution)
3.3 Develop technical training programme for electric vehicles, including equipment	Q1-2020	Q1-2020	SIT, DoLT and SMVDA	Estimating human capacity gap and cost	Q2-2020	Q4-2020	SIT	None (since all necessary expertise is already available at SIT)	65,000 (55,000 for one electric and one hybrid car)	Donor/development partner

Source: TNA project

2.1.2.6 Management Planning

This section identifies the risks to successful implementation of the TAP for Low Carbon Car Fleet. Measures to mitigate the risks are also identified. It also identifies the immediate critical steps that would be required to initiate TAP implementation.

Risks and Contingency Planning

Table 32 provides an overview of the main risks and contingency planning for the Low Carbon Car Fleet TAP. The main categories of risks that have been identified are: financial, cost escalation, scheduling, and technology performance. All the risks have been rate as low.

Next steps

The immediate requirement to proceed with the implementation of the TAP and the proposed Project Idea (PI) is to obtain political support for the TAP. This can be secured through a two stage process, namely:

1. Cabinet approval: The MFTED with the support from DoLT and RTC need to ensure that the validated TAP receives the approval of the Cabinet of Ministers. The Cabinet is the highest instance of decision making in government; and
2. TAP Steering Committee: The next logical step would be to put in place a Steering Committee (SC) that will oversee the execution of the TAP and PI. In order to avoid duplication, it is proposed that the cross-sectoral stakeholder working group that will be set up under Activity 1.4 will also perform the function of SC. The same structure will also implement the objectives of Activity 2.3. In general, the cross-sectoral committee will be constituted of the stakeholders listed in **Table 30**. The SC may be chaired by the DoLT with the RTC acting as co-chair.

There are three critical steps that need to be controlled in order to promote the uptake of electric and hybrid cars. The critical steps are also related to the fact that technology uptake is premised on developing synergies between Actions – i.e. overcoming barriers and associated risks independently of each other will not lead to technology transfer. With these considerations in mind, the critical steps are:

- Setting up of a subsidy scheme: The main barrier to technology transfer and scaling up is the higher costs of hybrid and electric cars compared to conventional technology. As discussed earlier and proposed in the PI, it will be crucial to set up the proposed subsidy scheme early in the TAP implementation. It is also noted that the subsidy scheme will most probably be time-bound, and that it will gradually be scaled back as the cost of low carbon cars decrease over time and consumers shift their preference away from conventional cars;
- Conducive regulatory framework: In order to strengthen social acceptability of hybrid and electric vehicles, it will be important to ensure that the market for imported vehicles is regulated through authorised dealership. This regulatory measure will ensure high quality after sales services through appropriately skilled workforce and availability of genuine spare parts; and
- Availability of skilled training for repairs and maintenance: The successful transfer of the technology for electric and hybrid cars will depend on quality after sales service that will be provided by authorised dealers. In particular, these dealers will need to have skilled workforce for carrying out maintenance and repairs of these low-carbon motorised technologies.

Table 32. Overview of risk categories and possible contingencies for Low Carbon Car Fleet TAP.

Type of risk	Related to Action or Activity	Description of risk	Contingency actions	
1. Financial risk	Action 1	Lack of financing is one of the most significant barriers that the technology uptake faces. Even if all other barriers were eliminated, lack of low-cost financing will still prevent technology uptake. The probability of this risk is low, and its impact is moderate. Consequently, the risk is low.	***Time interval for M&E:***	Annual
			M&E responsibility:	MFTED, DoLT and RTC
			Contingency measures needed:	The TAP has been designed to minimise the likelihood that adequate financing will not be achieved, through the design of the Activities under Action 1. The contingency plan is composed of a basket of measures such as the use of a consultant to develop the subsidy scheme and to train DoLT and MFTED staff to review the subsidy scheme on an annual basis. It is also envisaged that economic losses will need to be minimised through the annual review of the subsidy scheme. In this respect, a dedicated cross-sectoral working group that will also double up as the TAP steering committee will be set up.
			Responsibility contingency measure:	MFTED, and all project stakeholders
			Timing contingency measure:	Aligned with the action/activity plan shown in **Table 31**.
2. Cost escalation risk	Actions during the implementation phase	This is not expected to be an issue since the price of hybrid and electric cars are expected to decrease over time. While delays will lead to delays in overall emission reductions, it will have little bearing on the cost of TAP. The probability of this risk is low, and its impact is low. Consequently, the risk is low.	***Time interval for M&E:***	Annually
			M&E responsibility:	SEC and MEECC
			Contingency measures needed:	None
			Responsibility contingency measure:	Not applicable
			Timing contingency measure:	Not applicable
3. Scheduling risk			***Time interval for M&E:***	6 monthly

	All types of activities	An activity takes longer to complete than originally planned. The probability of this risk is low, and its impact is low. Consequently, the risk is low.	***M&E responsibility:***	DoLT and RTC
			Contingency measures needed:	The planning given in **Table 31** has made allowance for Activity schedule slippage.
			Responsibility contingency measure:	SEC and MEECC
			Timing contingency measure:	lifetime of TAP
4. Performance risk	Actions during the technology implementation phase	Hybrid and electric cars do not perform as expected. This is not expected to be the case since these low carbon vehicles have demonstrated their performance in different regions of the world, including in Seychelles. The only factor that can limit performance is the poor quality of after sales services. The probability of this risk is low, but its impact is moderate. Consequently, the risk is low.	***Time interval for M&E:***	Annually
			M&E responsibility:	DoLT, RTC, SIT and SMVDA
			Contingency measures needed:	Technology performance will be ascertained through the creation of an enabling environment favouring authorised dealership that will ensure high quality after sales services, including providing skilled technical workforce for maintenance and repairs, and ensuring availability of spare parts. Accredited technical training will be delivered by SIT.
			Responsibility contingency measure:	SIT, SMVDA
			Timing contingency measure:	Annual

Source: TNA project

2.1.2.7 TAP overview table – Low Carbon Car Fleet

The overview of the TAP for Low Carbon Car Fleet is given in **Table 33**.

Table 33. TAP overview table for Low Carbon Car Fleet.

Sector	**Energy**							
Sub-sector	Land transport							
Technology	Hybrid and electric cars for private use							
Ambition	By 2030, 70% and 10% of the total car fleet are hybrid or electric vehicles, respectively. In absolute terms, these targets represent an increment of 2,423 electric and 16,785 hybrid cars over the 2015 baseline.							
Benefits	The sustainable development benefits of the TAP are: (1) direct GHG emission reductions in 2030 of ~12.5 $ktCO_2$ per year; and (2) an avoided cost on energy bill in 2030 of ~US$ 2.8 million. Another benefit of the technology is that it does not entail incremental land use compared to conventional cars.							
Action	**Activities to be implemented**	**Sources of funding**	**Responsible body and focal point**	**Time frame**	**Risks**	**Success criteria**	**Indicators for Monitoring of implementation**	**Budget per activity**
Action 1: A subsidy on loan interest for hybrid and electric cars	Activity 1.1: Hire a consultant to develop the subsidy scheme in consultation with all stakeholders	Donor/development partner	DoLT and RTC	Q1-2020 to Q4-2020	Competent consultant to develop subsidy scheme will not be attracted	TA with adequate credentials and project references recruited	- Appointment of consultant - Subsidy scheme developed	10,000
	Activity 1.2: Seek formal approval of subsidy scheme in order to initiate implementation	DoLT and RTC (US$ 3,000 grant) SMVDA (US$1,500 in-kind)	DoLT and MFTED	Q1-2020 to Q3-2020	Disagreement over the proposed subsidy scheme leads to scheme not being approved	Subsidy scheme approved by Attorney General's Office and Cabinet of Ministers	Number of customers benefiting from subsidy scheme	4,000
	Activity 1.3: Capacity building of the Department of Land Transport to review and update subsidy scheme	Donor / Development Partner	DoLT and MFTED	Q4-2019 to Q1-2020	Lack of interest and low absorption capacity of DoLT and MFTED	A total of 4 staff trained on analysing subsidy scheme	Number of staff trained	10,000
	Activity 1.4: Establish multi-stakeholder working group to carry out long term monitoring of the subsidies	Government (MFTED and DoLT)	MFTEP, DoLT and SMVDA	Q4-2019 to 2021	Lack of participation from key stakeholders	High stakeholder participation and annual review of subsidy scheme is carried out	- Number of stakeholder meetings and number of participants	3,000

	and ensure elimination of economic losses						- Result of annual review of subsidy scheme	
Action 2: Establish authorised dealership for low carbon cars	Activity 2.1: Draft and approve strategy and guidelines for low carbon vehicle dealership	Donor/ Development partner	DoLT and RTC	Q1-2020 to Q3-2020	Lack of political support for setting up authorised dealership, and strategy not approved by key stakeholders	Strategy and guidelines developed and adopted by stakeholders	Number of approved strategy and guidelines	10, 000
	Activity 2.2: Carry out capacity building of car dealers on the strategy and guidelines	DoLT and RTC (US$ 3,000 grant) SMVDA (US$1,500 in-kind)	DoLT, RTC and SMVDA	Q3-2020 to Q1-2021	Lack of interest from members of SMVDA	At least 5 local authorised dealers trained on strategy and guidelines	Number of dealers trained	4,000
	Activity 2.3 Set up committee to oversee the development of the market for low-carbon cars	Covered under budget for Activity 1.4	DoLT, RTC and SMVDA	Q4-2019 to 2021	Low participation from stakeholders	Annual market review completed with high participation of TAP stakeholders	- Number of market reviews carried out - Number of participants in reviews	Covered under budget for Activity 1.4
Action 3: Training of qualified technicians to carry out repairs and maintenance	Activity 3.1: Hire consultant to carry out training needs assessment	Donor/developme nt partner	SIT, DoLT and SMVDA	Q2-2019 to Q2-2020	Inability to attract high calibre consultant to carry out training needs assessment	Training needs assessment completed	Number and type of training required	10,000
	Activity 3.2: Establish MOU with SIT for delivery of accredited training	Government (SIT and DoLT) (in-kind contribution)	DoLT, SMVDA and SIT	Q3-2019 to Q4-2019	Lack of interest from stakeholders to enter into an agreement over training needs and delivery	MOU signed between parties	Number of MOU signed	1,500
	Activity 3.3: Develop technical training programme for electric	Donor/developme nt partner	SIT	Q1-2020 to Q4-2020	Lack of interest or capacity for	- Training, including required	- Number of training developed	65,000

	vehicles, including equipment				setting up and delivering course by SIT or lack of interest from authorised car dealers to train their personnel through the SIT	- laboratory equipment, established - 10 technicians trained from between 3-5 authorised dealers	- Value of laboratory equipment/assets purchased using TAP funding - Number of technicians trained	(55,000 for one electric and one hybrid car)

Source: TNA project

2.1.3. Action Plan for Victoria Traffic Management Plan (VTMP)

2.1.3.1 Introduction

Victoria hosts a dense traffic and congestion is on the rise. Proper traffic management can ensure that traffic flows smoothly and efficiently; there is fair access for different transport modes; roads and streets are safe for all users; roads full of motorised traffic do not constitute barriers blocking movement between areas; congestion, local pollution and noise are minimised; neighbourhoods, pedestrian areas and the overall character of localities are protected from the negative impact of high traffic levels; and greenhouse gas is reduced.

The VTMP therefore proposes several interventions that will support achieving the above objectives that can be achieved by proper traffic management in Victoria. The main elements of the VTMP are (Government of Seychelles, 2017b):

- ✓ The central bus terminal in Victoria will be relocated to two separate facilities to assist alleviating congestion in Victoria by allowing the provision of faster and more reliable services, which avoid congestion hotspots around Victoria city centre. The two new facilities, one at Roche Caiman and one at Ile du Port would provide decentralised bus transfer locations and depots, and act as an important interchange point between other modes (see 'park and ride' description below);
- ✓ Putting in place incentives and disincentives that can support modal shift away from private car use towards public transport, including: limiting parking space, applying parking charges, creating awareness campaigns, and providing a 'park-and-ride' service from Roche Caiman to Victoria and from Ile du Port to Victoria. These measures could be coupled with carpooling, and car sharing through differential car tolls, and electronic car pricing in the Central Business District (CBD);
- ✓ Construction of a Western Victoria bypass between Beau Vallon and Saint Louis which includes a new stretch of road and highway improvement works; and
- ✓ Dualling of the Bois de Rose venue/Providence Highway/East Coast Road between Victoria and Anse Royale.

The technology offers numerous advantages over the other power sector mitigation technologies analysed in the TNA project, such as (Government of Seychelles, 2017a): (1) direct GHG emission reductions in 2030 of ~8.4 $ktCO_2$ per year; and (2) avoided cost on energy bill in 2030 of ~US$ 1.67 million per year (or cumulative avoided cost of ~US$ 13.7 million between 2020 and 2030). The VTMP will require an estimated 7 ha of land to increase the road network. The TNA project has estimated that the VTMP will avoid economic losses due to traffic congestion equivalent to ~US$ 35 million per year in 2030, and cumulative avoided economic losses of ~ US$ 309 million between 2020 and 2030.

2.1.3.2 Ambition for the TAP

The VTMP is expected to reduce national GHG emissions in 2030 by 5%. Modelling carried out in the TNA project has assumed that the impacts of the VTMP will increase gradually from 25% in 2020 to 50% in 2021 to 75% in 2022. The full impacts of the VTMP on emission reductions will be achieved in 2023. Under these assumptions, cumulative emission reductions of ~68.6 $ktCO_2$ will be achieved between 2020 and 2030.

2.1.3.3 Actions and Activities selected for inclusion in the TAP

The approach used for identifying and selecting Actions and Activities in the VTMP TAP is the same as that used for the other mitigation technologies (see for example section 2.1.2.3). Project Ideas (PIs) have been proposed to start the technology transfer process by focusing on Actions and Activities of immediate urgency and those presenting low-hanging fruits. As far as practicable, the PIs would support enabling conditions for promoting multiple mitigation technologies simultaneously.

Summary of barriers and measures to overcome barriers

Table 34 provides a summary of the barriers and measures identified for VTMP.

Table 34. Overview of barriers and measures to overcome these for VTMP.

Categories	Identified barriers	Measures to overcome barriers
Economic and financial	High up-front costs to implement the part of the project related to its hardware components such as the construction of roads, bridges and/or tunnels	A government-guaranteed loan denominated in foreign currency (i.e. US$) at a fixed concessional interest rate of 2% per annum for a period of 15 years
Policy, Legal and regulatory	Not enough linkages of plans and programmes	Proposed designated authority to seek endorsement of the Seychelles Strategic Plan (SSP) by the Cabinet of Ministers, and to declare the SSP as the national master plan for the Seychelles
Institutional and organizational capacity	Not enough monitoring and evaluation of the implementation of the VTMP	Setting up of a high level inter-ministerial steering committee to oversee the implementation of the VTMP
Human skills	Lack of domestic consultants to assess and address traffic management issues	Study tours for selected public staff in order to increase their knowledge and skills in specific areas, such as urban planning, multi-modal development planning in urbanised areas, and deployment and use of real-time traffic management technologies for efficient traffic management
Technical	• Lack of technologies to carry out real live monitoring to traffic in Victoria during peak hours • Very limited land available in and around Victoria for building new roads, (expensive) reclamation may be needed to create more land.	• Introduction of technologies for the real-time monitoring of traffic in and around Victoria • Prospecting the merits of using bridges, over passes, and roads built on pillars as alternatives to land reclamation

Source: TNA project

Actions selected for inclusion in the TAP (VTMP)

The rationale for selecting measures for inclusion as Actions in the TAP is the same as that used for the power sector (section 1.1.2) and the previous land transport mitigation technology (section 2.1.2). The ambition of the technology target is based on the assumption that all the measures will be implemented simultaneously. Consequently, all the identified measures are ranked as medium to high in terms of urgency. Only when a measure is being covered by an existing initiative, has the urgency of that measure been ranked as low.

Table 35 provides an assessment of the measures considered for inclusion in the VTMP TAP. Because of their medium-to-high urgency, all the measures have been retained as Actions.

Table 35. Assessment of measures for VTMP.

Measures to overcome barriers	Assessment	Ranking
Financial & Economic Measures Access to cheap capital with a government guarantee, denominated in foreign currency (i.e. US$ or EUR) at a fixed concessional interest rate	This will give confidence to the project that the repayment will be kept constant as a SR loan may be subject to foreign exchange fluctuation. As this is a public good, the return on investment may not be within the acceptable commercial margins. This project is estimated to cost over US$55 million mostly to build infrastructure that will reduce or eliminate traffic congestion. As the country is still under the IMF economic reform period, both government borrowing and spending is closely monitored and there are ceilings in place on both the amount that can be borrowed or spent. The	high

Measures to overcome barriers	Assessment	Ranking
	financial measure will benefit from putting in place an enabling environment as discussed below in this table.	
Policy, Legal and Regulatory Measures Endorsement of the Seychelles Strategic Plan (SSP) as the national master plan for the Seychelles	The SSP is a comprehensive document that lays out a clear pathway to an integrated and coherent land use development plan for Victoria and the rest of Mahé. The SSP gives a clear direction and guidance for the TAP implementation as it contains baseline scenarios related to the project. Currently, there is no guiding document or master plan for infrastructure development locally, except for the outdated Town and Country Planning Act of 1972. In the absence of modern legislations and proper guiding policies that will guide infrastructure development, the SSP will provide a well thought out guideline. As the land in and around Victoria is limited and there is stiff competition for development, then a system of prioritising land and development as laid out in the SSP will provide a good starting point to ensure the right decisions are taken. The TAP, therefore, promotes the formal endorsement of the SSP as the national master plan for the physical development of Seychelles by competent authorities.	high
Institutional & Organisational Measures Setting up of a high level inter-ministerial steering committee to oversee the implementation of the VTMP	As discussed above, there are no up to date legislations and policies that guides infrastructural development in the country. The only mechanism to approve infrastructural development is the Planning Authority (PA) Board, in some cases assisted but SIB and the ministry responsible for tourism. But these are coordinated efforts for some projects, and the mechanism adopts an ad hoc approach. A long term solution needs to be in place to ensure that infrastructure projects are efficiently and effectively carried out through a more concerted effort for high level, cross-sectoral coordination.	high
Human Capacity Measures Increasing knowledge and skills in specific areas of traffic management and using real-time traffic management technologies for efficient traffic management	At the core of deploying a new technology is the understanding and access to information pertaining to that particular technology. Some technologies are much easier to be deployed given their simplicity, but others, such as the VTMP, are not as easy given the variety and complexity of measures included in the technology package. In order to enhance the human skills of DoLT and SLTA staff, study tours for selected public staff in order to increase their knowledge and skills are proposed.	Medium
Technical Measure Prospecting the merits of using of bridges, over passes, 'tunnels' and roads built on pillars as alternatives to land reclamation	Given the topography of the Seychelles, implementing the VTMP in an area that is already constrained by land availability remains a challenge. Further, the VTMP cannot make use of off-the-shelf technologies. Hence, a map of alternative land-use options has to be drawn out pertaining to local constraints within the scope of this TAP. The cartography of alternative land-use options is proposed to be carried out early in the TAP implementation since it will be significant bearing on implementation of the VTMP. Further, in order to better understand the traffic congestion problem in Victoria, the use of real-time monitoring of traffic flux at different hours of the day will be required.	High

Source: TNA project

Activities identified for implementation of selected Actions

Five Actions related to the medium and high urgency measures in **Table 35** have been retained for inclusion in the VTMP TAP. The accompanying Activities are listed in **Table 36**.

Table 36. Summary of Actions for VTMP TAP and their corresponding Activities.

Summary of Actions	
Action 1:	**Low interest loan denominated in foreign currency**
Action 2:	**Official endorsement of the SSP**
Action 3:	**Setting up inter-ministerial VTMP oversight committee**
Action 4:	**Increased knowledge and skills of stakeholders in technical areas related to the project**
Action 5:	**Technical options to improve the VTMP**
Activities for Action implementation	
Action 1: Low interest loan denominated in foreign currency	
Activity 1.1	A project cost benefit analysis is completed through recruitment of services providers (to be carried out after Activity 5.3)
Activity 1.2	Identify and discuss financing options with financial institutions
Activity 1.3	Negotiate and secure financing
Action 2: Official endorsement of the SSP	
Activity 2.1	Carry out a validation exercise for the SSP on a national level (to be carried out after Activity 5.3)
Activity 2.2	Prepare final draft based upon validation exercise
Activity 2.3	Present the SSP to the Cabinet of Ministers for endorsement
Action 3: Setting up inter-ministerial VTMP oversight committee	
Activity 3.1	Draft and approve ToR for oversight committee (including an authority clause and membership)
Activity 3.2	Secure resources (including financial resource) for operationalising the oversight committee
Activity 3.3	Put in place a schedule of meetings, and a monitoring and evaluation framework for the committee's oversight of VTMP implementation
Action 4: Increase knowledge and skills of stakeholders in technical areas related to the project	
Activity 4.1	Hire consultant to carry out skills needs assessment
Activity 4.2	Develop an action plan, including a budget, for skills improvement in the context of VTMP implementation
Activity 4.3	Carry out study tours for selected staff of DoLT and SLTA
Action 5: Technical options to improve the VTMP	
Activity 5.1	Carry out financial, economic and technical study of using bridges, over passes and roads built on pillars as alternatives to land reclamation through consultancy services (to be carried out before Activity 1.1)
Activity 5.2	Implementing real time traffic monitoring in and around Victoria
Activity 5.3	Review and update the SSP and VTMP in light of the findings of Activities 5.1 and 5.2 (to be used as input to Activity 2.1)

Source: TNA project

Actions to be selected as Project Ideas

A Project Idea (PI) is proposed to implement Actions/Activities of immediate urgency and, which constitute pre-requisite for the implementatin of other Actions/Activities. Actions that promote the enabling environment across multiple technologies have also been selected as PIs. The PI for VTMP will, therefore, include:

- Action 5: The activities comprising Action 5 need to be carried out first before the SSP can be finalised (Action 2) and before the detaield benefit cost analyses for the VTMP are concluded (Action 1). The PI will contain all the activities pertaining to Action 1; and
- Action 3: It will be important to set up the oversight committee for the implementation of the VTMP. The proposed oversight committee can also be used as the steering committee that will provide political support for implementing the VTMP TAP.

2.1.2.4 Stakeholders and Timeline for implementation of TAP

This section identifies the stakeholders who will be responsible to implement the TAP, and their roles in the process are defined. It also gives the sequence and timing of each Activity.

Overview of Stakeholders

The Action-specific roles of the main stakeholders in the implementation of the VTMP TAP are given in **Table 37**. The list of also contains stakeholders whose identities are currently unknown – i.e. they will be recruited or appointed during TAP implementation, but whose roles are well defined. In these cases, and where possible and practicable, potential stakeholders are identified to guide further action.

Table 37. Roles of stakeholders involved in the implementation of the VTMP TAP.

Key Stakeholders	Role
Department of Land Transport (DoLT) (Actions 1, 2, 3, 4 and 5)	The DoLT is the parent department in charge of formulating policies for the energy sector (including power sector), as well as overseeing the development of policy instruments such as legislation and institutional arrangements in order to implement the policies. DoLT will be charged to overseeing the implementation of the TAP, and it will also be a beneficiary of capacity building under Action 4.
Road Transport Commission (Actions 1, 3, 4 and 5)	As the Regulator for the transport sector, the RTC will be directly responsible for supervising and assisting in the implementation of the projects in (all) the transport sector and their impacts on the transport systems, including traffic flows and congestions in Victoria. Its contributions will be mainly towards Actions 1, 3 and 5. Selected staff of the RTC will also receive training under Action 4.
Ministry of Finance, Trade and Economic Planning (MFTEP) (Action 1)	MFTEP is the mandated public institutions to negotiate and contract government-guaranteed loans in Seychelles. Consequently, the ministry will be closely involved in all Activities pertaining to Action 1, coordinating potential financial policies and mechanisms and working with financial institutions to ensure the best possible option is made available to the consumers.
Seychelles Land Transport Agency(SLTA) (Action 1 and 5)	The SLTA is responsible for building and maintaining roads and other infrastructure in the land transport sector. The SLTA will be closely involved in evaluating alternative infrastructure options planned under Action 5, and in the finalisation of the benefit cost analyses for the VTMP planned under Action 1.
Seychelles Planning Authority (SPA) (Actions 2, 3 and 5)	The SPA is the institutional mandated for the development of the SSP. The Authority regulates physical development on land. Consequently, the SPA will be involved in proposing and validating alternative options to land reclamation that will be studied under Action 5, and it will take the lead for updating the SSP. The SPA will also coordinate the process of endorsing the updated SSP that is planned under Action 2. Finally, the SPA will be a key member in the inter-ministerial oversight committee that is planned to be set up under Action 3.
Financial Institutions (bilateral and multilateral) (Action 1)	One of the main objectives of Action 1 is to identify the most suitable financial mechanism and financial institution for the provision of loans for implementing the VTMP. Examples of potential financial institutions are multilateral development partners, such as the World Bank, African Development Bank or European Investment Bank or through bilateral agreement. Government financial mechanism should also be prospected.

Source: TNA project

Scheduling and sequencing of specific activities

A detailed timetable for the activities can be found in the planning table below (**Table 38**). The TAP for VTMP is planned for implementation between 2019 and 2020. However, for the actions envisioned under this TAP the sequencing would be approximately as follows:

Action 1: Low interest loan denominated in foreign currency – The detailed benefit cost analysis planned under Action 1 cannot be carried out until Action 5 has been completed. It is proposed that Activity 1.1 should overlap with Activity 5.3. Consequently, this action will be carried out in 2020;

Action 2: Official endorsement of the SSP – Action 2 will take place after the completion of Actions 5 and 1. The updated and revised SSP is therefore planned for endorsement in late 2020;

Action 3: Setting up inter-ministerial VTMP oversight committee –This Action will form part of the PI and it will be implemented upfront. The inter-ministerial oversight committee will be set up in 2019, and the same structure can be used as the TAP steering committee;
Action 4: Increased knowledge and skills of stakeholders in technical areas related to the project – Since this Action is of moderate urgency, it will be implemented in 2019 and 2020; and
Action 5: Technical options to improve the VTMP – This Action is a crucial one, since it is a pre-requisite for carrying out Actions 1 and 2. For this reason, it has been included in the PI for VTMP. Much attention has to be provided to monitor its implementation as any dealys will has cascading effects on Actions 1 and 2. It is proposed that Action 5 be initiated at the beginning of 2019 and completed in 2020.

2.1.2.5 Estimation of Resources Needed for Action and Activities

This section discusses the capacity building elements of the TAP, as well as an estimation of its implementation costs.

Estimation of capacity building needs

Capacity building is an element that cuts across all the Actions, and is justified from the perspective that human and institutional learning can take place at any moment during TAP implementation. Nevertheless, Action 4 is dedicated to human capacity building through the following:

- Activity 1.1: Conducting a skills needs assessment in the context of implementing the VTMP;
- Activity 1.2: Developing an action plan based on the results of Activity 1.1; and
- Activity 1.3: Selected staff of DoLT and SLTA participating in study tours to hone their skills in integrated and sustainable traffic management.

Estimations of costs of actions and activities

The cost of each Activity constituting the TAP is provided in **Table 38**. The total cost is estimated at US$ 321,500 that will be funded through a combination of cash/grant and in-kind financing. The in-kind financing is estimated at US$19,500 for Activities 1.2, 1.3, 2.3 and 3.1. Further, government (DoLT, SLTA, SPA and MFTEP) is expected to contribute US$ 15,000 for implementing Activity 3.2. Therefore, US$ 287,000 is expected to be funded through the financial support of donors and development partners, including international climate finance sources.

The TAP does not cover the cost of the low-interest loan that has been estimated in the order of US$ 55 million (Government of Seychelles, 2017b). The total cost of the VTMP will require review based on the updates brought to the SSP as per activities under Actions 1 and 5.

Table 38. Planning table - characterisation of activities for implementation of actions for VTMP.

Action 1:	**Low interest loan denominated in foreign currency**									
Activities	**Planning**				**Implementation**				**Costs and funding needs**	
	Start	Complete	Who	Capacity needs	Start	Complete	Who	Capacity needs	Costs (US$)	Who will fund
1.1 A project cost benefit analysis is completed through recruitment of services providers (to be carried out after Activity 5.3)	Q4-2019	Q4-2019	DoLT and SLTA	Definition of Terms of Reference (ToR)	Q4-2019	Q1-2020	MFTEP and DoLT	None (provided by Services Provider / Consultant)	20,000	Donor / Development Partner
1.2 Identify and discuss financing options with financial institutions	Q1-2020	Q1-2020	MFTEP, DoLT	None	Q1-2020	Q2-2020	MFTEP	None	6,000	Government (in-kind contribution)
1.3 Negotiate and secure financing	Q1-2020	Q1-2020	MFTEP	None (coordination of financial institutions is an existing skill at MFTEP)	Q2-2020	Q3-2020	MFTEP	None (negotiation skills already exist at MFTEP)	10,000	Government (in-kind contribution)
Action 2:	**Official endorsement of the SSP**									
Activities	**Planning**				**Implementation**				**Costs and funding needs**	
	Start	Complete	Who	Capacity needs	Start	Complete	Who	Capacity needs	Costs (US$)	Who will fund
2.1 Carry out a validation exercise for the SSP on a national level	Q1-2020	Q1-2020	SPA	Planning skills for institutional coordination	Q2-2020	Q2-2020	SPA (and all key stakeholders)	Institutional coordination skills already exist at SPA	15,000	Donor / Development Partner

(to be carried out after Activity 5.3)				already exist at SPA						
2.2 Prepare final report based upon validation exercise	Q2-2020	Q2-2020	SPA	None	Q3-2020	Q3-2020	SPA	None (carried out by consultant for Activity 5.3)	Covered under budget for Activity 5.3	Covered under budget for Activity 5.3
2.3 Present the SSP to the Cabinet of Ministers for endorsement	Q3-2020	Q3-2020	SPA, MFTEP	None	Q4-2020	Q4-2020	SPA, Cabinet of Ministers	None	1,500	Government (in-kind contribution)
Action 3:	**Setting up inter-ministerial VTMP oversight committee**									
Activities	**Planning**				**Implementation**				**Costs and funding needs**	
	Start	Complete	Who	Capacity needs	Start	Complete	Who	Capacity needs	Costs (US$)	Who will fund
3.1 Draft and approve ToR for oversight committee (including an authority clause and membership)	Q1-2019	Q1-2019	DoLT, SLTA, SPA, MFTEP	Definition of ToR	Q1-2019	Q2-2019	DoLT and SLTA	Capacity to coordinate institutional stakeholders	2,000	Government (in-kind contribution)
3.2 Secure resources (including financial resource) for operationalising the oversight committee	Q1-2019	Q1-2019	DoLT, SLTA, SPA, MFTEP	Institutional coordination capacity	Q1-2019	Q2-2019	DoLT, SLTA, SPA, MFTEP	None	15,000	Government
3.3 Put in place a schedule of meetings, and a monitoring and evaluation framework for the committee's	Q2-2019	Q2-2019	DoLT, SLTA, SPA, MFTEP	Understanding of the requirements to develop an action plan, its budget and structure of a	Q3-2019	Q3-2019	DoLT (with support from other stakeholders)	Capacity to develop action plan, budgeting and developing M&E framework for oversight committee	10,000	Donor/development partner

oversight of VTMP implementation				solid M&E framework						
Action 4:	**Increase knowledge and skills of stakeholders in technical areas related to the project**									
Activities	**Planning**				**Implementation**				**Costs and funding needs**	
	Start	Complete	Who	Capacity needs	Start	Complete	Who	Capacity needs	Costs (US$)	Who will fund
4.1 Hire consultant to carry out skills needs assessment	Q2-2019	Q2-2019	DoLT (with support from oversight committee members)	Definition of the scope of the ToR	Q3-2019	Q3-2019	DoLT (with support from oversight committee members)	None (provided by consultant)	7,500	Donor/development partner
4.2 Develop an action plan, including a budget, for skills improvement in the context of VTMP implementation	Q3-2019	Q3-2019	DoLT (with support from oversight committee members)	Definition of the scope of the ToR	Q4-2019	Q1-2020	DoLT (with support from oversight committee members)	Services provided by consultant recruited for Activity 4.1	7,500	Donor/development partner
4.3 Carry out study tours for selected staff of DoLT and SLTA	Q4-2018	Q4-2018	DoLT and SLTA (with inputs from members of the oversight committee)	To carry out scoping study of the best destinations for carry study tours	Q1-2019	Q1-2019	DoLT and SLTA	none	12,000	Donor/development partner
Action 5:	**Technical options to improve the VTMP**									
Activities	**Planning**				**Implementation**				**Costs and funding needs**	
	Start	Complete	Who	Capacity needs	Start	Complete	Who	Capacity needs	Costs (US$)	Who will fund
5.1 Carry out financial, economic and technical study of alternatives to land	Q4-2018	Q4-2018	SPA and DoLT	Defining the scope of the ToR and especially the alternative options and	Q1-2019	Q3-2019	SPA and DoLT	All technical services will be provided by the contracted services provider	90,000	Donor/development partner

reclamation through consultancy services				extent of civil engineering work required						
5.2 Implementing real time traffic monitoring in and around Victoria	Q4-2018	Q4-2018	DoLT and SLPA	Human skills to deploy and use real time traffic monitoring tools and equipment	Q1-2019	Q4-2019	DoLT and SLPA	All skills are expected to be covered by capacity building under Action 4	50,000	Donor/development partner
5.3 Review and update the SSP and VTMP in light of the findings of Activities 5.1 and 5.2 (to be used as input to Activity 2.1)	Q4-2019	Q4-2019	SPA (with inputs from all stakeholders)	Scope of ToR for updating the SSP based on results from Activities 5.1 and 5.2	Q4-2019	Q1-2020	SPA (with inputs from all stakeholders)	Will required consultancy skills that was used to develop the SSP 2040	75,000	Donor/development partner

Source: TNA project

2.1.3.6 Management Planning

This section identifies the risks associated with implementing the VTMP TAP for. Measures to mitigate the risks are also identified. It also identifies the immediate critical steps that would be required to initiate TAP implementation.

Risks and Contingency Planning

Table 39 provides an overview of the main risks and contingency planning for the VTMP TAP. The main categories of risks that have been identified are: financial, scheduling, and technology performance. All the risks have been rate as low, except for scheduling risk that is rated medium.

Next steps

The immediate requirement to proceed with the implementation of the TAP and the proposed Project Idea (PI) is to obtain political support for the TAP. This can be secured through a two stage process, namely:

1. Cabinet approval: The SPA and DoLT with the support from SLTA and MFTEP need to ensure that the validated TAP receives the approval of the Cabinet of Ministers. The Cabinet is the highest instance of decision making in government; and
2. TAP Steering Committee: The next logical step would be to put in place a Steering Committee (SC) that will oversee the execution of the TAP and PI. In order to avoid duplication, it is proposed that the inter-ministerial oversight group that will be set up under Action 3 will also perform the function of SC. In general, the committee will be constituted of the stakeholders listed in **Table 37**. The SC may be chaired by the DoLT with the SPA acting as co-chair.

Two critical steps need to be controlled in order to promote the implementation of the VTMP. The critical steps are also related to the fact that technology uptake is premised on developing synergies between Actions – i.e. overcoming barriers and associated risks independently of each other will not lead to technology transfer. With these considerations in mind, the critical steps are:

- Formal approval of the SSP: The VTMP is a complex programme of action requiring the collaboration of multiple stakeholders. It also requires extensive physical development in and around Victoria. For sustainability, the implementation of the VTMP should be guided by an overarching physical development master plan that has been formulated using extensive and inclusive stakeholder participation. The SSP is the overall development plan that can provide guidance. However, there are physical development options that were not considered in the existing SSP and that the TAP proposes to carry out under Action 5. Further, to the best of our knowledge, the SSP is yet to be formally adopted as the master plan for the physical development of Seychelles. Therefore, the TAP for VTMP provides an opportunity both to update the SSP and to obtain its formal approval and adoption; and
- A high-level multi-stakeholder support: The VTMP is an ambitious undertaking that will require strong political support from all concerned stakeholders. It is therefore crucial to set up an inter-ministerial committee that will have the oversight of the VTMP implementation. High political support will also be required to update and formally approve the SSP as the overarching physical development plan of Seychelles.

Table 39. Overview of risk categories and possible contingencies for VTMP TAP.

Type of risk	**Related to Action or Activity**	**Description of risk**	**Contingency actions**	
1 Cost Risks	All activities	The cost of activities may be higher than budgeted due to delays in the implementation of activities. The probability of this risk is low since the activities are well defined, and no capital costs are anticipated. Further, Seychelles already has experience with the formulation of the SSP. The impact is low since the cost categories, mainly consultancy, are well defined. Consequently, the risk has been rated low.	***Time interval for M&E:***	Every 6 months
			M&E responsibility:	DoLT
			Contingency measures needed:	Strict monitoring of implementation of activities according to work plan given in **Table 38**.
			Responsibility contingency measure:	SC
			Timing contingency measure:	2018 to 2021
2 Scheduling risks	All activities	Delays may occur in the implementation of activities that can delay TAP implementation. Since the VTMP will eventually involve significant capital investments (Activity 1.3), delays in TAP implementation will most probably lead to increases in the cost of the VTMP. Since Actions 1, 2 and 5 are implemented in series; the probability of this risk	***Time interval for M&E:***	Annually
			M&E responsibility:	SC
			Contingency measures needed:	Requires close monitoring and period review of work plan given in **Table 38**.
			Responsibility contingency measure:	SC
			Timing contingency measure:	2018-2021

		may be moderate. The impact is rated as medium as already explained by the follow on effects due to delays. Hence, the risk has been rated as moderate to high.		
3 Performance risks	All activities	The technology (hardware or software) may not perform as planned or intended. Since the TAP is not hardware-intensive, the probability and impact of this risk are low. Hence, the risk has been rated as low.	***Time interval for M&E:***	Annually
			M&E responsibility:	DoLT
			Contingency measures needed:	Requires close monitoring and period review of work plan given in **Table 38**.
			Responsibility contingency measure:	SC
			Timing contingency measure:	2018-2021

Source: TNA project

2.1.3.7 TAP overview table – VTMP

The overview of the TAP for VTMP is given in **Table 40**.

Table 40. TAP overview table for VTMP.

Sector	Energy							
Sub-sector	Land transport							
Technology	Victoria Traffic Management Plan (VTMP)							
Ambition	The VTMP is expected to reduce national GHG emissions in 2030 by 5%. Modelling carried out in the TNA project has assumed that the impacts of the VTMP will increase gradually from 25% in 2020 to 50% in 2021 to 75% in 2022. Cumulative emission reductions of ~68.6 $ktCO_2$ will be achieved between 2020 and 2030.							
Benefits	The sustainable development benefits of the TAP are: (1) direct GHG emission reductions in 2030 of ~8.4 $ktCO_2$ per year; and (2) avoided cost on energy bill in 2030 of ~US$ 1.67 million per year (or cumulative avoided cost of ~US$ 13.7 million between 2020 and 2030). The VTMP will require an estimated 7 ha of land to increase the road network. The TNA project has estimated that the VTMP will avoid economic losses due to traffic congestion equivalent to ~US$ 35 million per year in 2030, and cumulative avoided economic losses of ~ US$ 309 million between 2020 and 2030.							
Action	**Activities to be implemented**	**Sources of funding**	**Responsible body and focal point**	**Time frame**	**Risks**	**Success criteria**	**Indicators for Monitoring of implementation**	**Budget per activity**
Action 1: Low interest loan denominated in foreign currency	Activity 1.1: A project cost benefit analysis is completed through recruitment of services providers	Donor / Development Partner	MFTEP and DoLT	Q4-2019 to Q1-2020	Competent Services Provider will not be attracted	Cost benefit analysis completed and approved	- Appointment of consultant - Cost benefit analysis developed - Cost benefit analysis approved	20,000
	Activity 1.2: Identify and discuss financing options with financial institutions	Government (in-kind contribution)	MFTEP	Q1-2020 to Q2-2020	Low interest from financial institutions	Large number of financial institutions interested to fund the VTMP	Number of financial institutions with an interest to fund VTMP	6,000
	Activity 1.3: Negotiate and secure financing	Government (in-kind contribution)	MFTEP	Q1-2020 to Q3-2020	Disagreements over the terms and conditions of loan	Financing for the VTMP is secured	- Number of financial institutions that participated in negotiations - Number of contract signed - Value of loan secured	10,000
Action 2: Official endorsement of the SSP	Activity 2.1: Carry out a validation exercise for the SSP on a national level	Donor/ Development partner	SPA (and all key stakeholders)	Q1-2020 to Q2-2020	Low participation of stakeholders does not allow	Energy Act is updated with provision for private sector participation in the power market	- Number of participants in validation exercise - Validation report approved by SC	15, 000

					adequate validation of the SSP	and feed-in tariffs for renewable energies are scheduled		
	Activity 2.2: Prepare final report based upon validation exercise	Covered under budget for Activity 5.3	SPA	Q2-2020 to Q3-2020	Inconclusive validation exercise does not allow for finalisation of the SSP	SSP and VTMP are reviewed and updated based on the results of the validation exercise to the satisfaction of the SC	Number of physical development plans updated based on results of validation exercise	Covered under budget for Activity 5.3
	Activity 2.3: Present the SSP to the Cabinet of Ministers for endorsement	Government (in-kind contribution)	SPA, Cabinet of Ministers	Q3-2020 to Q4-2020	Lack of political support to present SSP to Cabinet for endorsement	Updated SSP is endorsed by Cabinet as the overarching physical development plan of Seychelles	Updated SSP endorsed by Cabinet	1,500
Action 3: Setting up inter-ministerial VTMP oversight committee	Activity 3.1: Draft and approve ToR for oversight committee	Government (in-kind contribution)	DoLT and SLTA	Q1-2019 to Q2-2019	Poor quality of ToR	VTMP oversight committee constituted with very high level inter-ministerial membership	Number of members and positions held	2,000
	Activity 3.2: Secure resources (including financial resource) for operationalising the oversight committee	Government	DoLT, SLTA, SPA, MFTEP	Q1-2019 to Q2-2019	Inability to secure human and financial resources to operationalise the oversight committee	Amount of resources (financial and human) mobilised by source	Sources and type of resources mobilised to operationalise the oversight committee	15,000
	Activity 3.3: Put in place a schedule of meetings, and a monitoring and evaluation framework for the committee's oversight of VTMP implementation	Donor/development partner	DoLT (with support from other stakeholders)	Q2-2019 to Q3-2019	Poor work plan and M&E framework developed	High quality work plan and M&E framework developed with high institutional and political buy-in	- Number of work plan and M&E framework developed and approved - Notes of meetings of the oversight committee	10,000

Action 4: Increase knowledge and skills of stakeholders in technical areas related to the project	Activity 4.1: Hire consultant to carry out skills needs assessment	Donor / Development Partner	DoLT (with support from oversight committee members)	Q2-2019 to Q3-2019	Poor skills needs assessment because of low standards of services provider	Skills needs assessment developed and approved by SC	Skills needs assessment developed and SC approval	7,500
	Activity 4.2: Develop an action plan, including a budget, for skills improvement in the context of VTMP implementation	Donor / Development Partner	DoLT (with support from oversight committee members)	Q3-2019 to Q1-2020	Action plan is of poor quality because of low quality baseline assessments	High quality action plan is approved by SC	Action plan developed and approval by SC	7,500
	Activity 4.3: Carry out study tours for selected staff of DoLT and SLTA	Donor/ Development partner	DoLT and SLTA	Q4-2018 to Q1-2019	Low interest from participants and/or low institutional absorption capacity once personnel has been trained	2 staff from each of DoLT and SLTA have carried out study tours and experience obtained has been institutionalised (e.g. to competently carry out Activity 5.2)	- Number of staff participating in study tours - Number of instances when knowledge gained from study tours is put to effective use - Number of other staff trained using knowledge gained from study tours	12,000
Action 5: Technical options to improve the VTMP	Activity 5.1: Carry out financial, economic and technical study of alternatives to land reclamation	Donor/development partner	SPA and DoLT	Q4-2018 to Q3-2019	Low quality ToR results in the recruitment of low profile services provider	High calibre services provider is recruited, and solid technical study of alternatives to land reclamation is completed	- Number of studies completed and approved by SC	90,000
	Activity5.2: Implementing real time traffic monitoring in and around Victoria	Donor/development partner	DoLT and SLPA	Q4-2018 to Q4-2019	Real time monitoring is ineffectively used due to a combination of low quality	Monitoring systems in place and data used to inform decision making	- Number of monitoring systems installed - Number of instances when data from real time monitoring is	50,000

					equipment and low capacity to measure and use data		used in development planning	
	Activity 5.3: Review and update the SSP and VTMP in light of the findings of Activities 5.1 and 5.2	Donor/ Development partner	SPA (with inputs from all stakeholders)	Q4-2019 to Q1-2020	Inability to attract high quality services provider to update SSP and VTMP	SSP and VTMP are reviewed and updated to the satisfaction of the SC	Number of physical development plans updated and updates approved	75,000

Source: TNA project

2.1.4. Action Plan for Electric Scooter (e-scooter)

2.1.4.1 Introduction

The electric scooter (e-scooter) looks like and is operated very much like a motorcycle or motorised scooter. However, there is no internal combustion engine and gas tank, which means that there are less moving parts to wear out. Electric scooters (as distinct from motorcycles) have a step-through frame. An e-scooter is a plug-in electric vehicle with two wheels powered by electricity. Similar to the electric cars, electricity is stored on board in a rechargeable battery, which drives one or more electric motors. There are several technological issues that may make an e-scooter less attractive than a conventional motorcycle, including: the range limitation of the e-scooter (due to the relatively small battery size), the low speed usually ranging between 30 to 40 km/h, and the time it takes to charge the battery (up to 8 hours) (Government of Seychelles, 2017b). However, they are quite appropriate for inner city commuting and in instances where driving distances are relatively short. E-scooters are relatively easy to maintain compared to a conventional scooters as the system is relatively simple, there is no lubricating, adjusting and tuning to do. The main consumables are brake pads, tires, and potentially a brake fluid flush.

The topography of the granitic islands may explain the low penetration of motorised two-wheelers (at 1.3% of total number of motorised vehicles) (Government of Seychelles, 2017a). However, there is a niche for two-wheelers for inner city commuting and on the flat stretches of the main populated islands of Seychelles.

E-scooters offer numerous advantages compared to conventional technologies, such as (Government of Seychelles, 2017a, 2017b): (1) direct GHG emission reductions in 2030 of ~744 tCO_2 per year; and (2) an avoided cost on energy bill in 2030 of ~US$ 154,500. Because of the small size of Seychelles, land is a valuable and expensive commodity. Another benefit of the technology is that it does not entail incremental land use compared to conventional cars.[10]

2.1.4.2 Ambition for the TAP

It is expected that there would be an additional number of 1,500 e-scooters by 2030.

2.1.2.3 Actions and Activities selected for inclusion in the TAP

This section provides a discussion of the Actions and Activities that have been selected to inclusion in the TAP for e-scooters. The Actions are linked to the measures that were identified following detailed analyses of barriers facing the technology (Government of Seychelles, 2017b), as well as the enabling environment required to promote the technology. While the technology transfer will rest on the implementation of all Actions, Project Ideas (PIs) have been proposed to start the technology transfer process by focusing on Actions and Activities of immediate urgency and those presenting low-hanging fruits. As far as practicable, the PIs would support enabling conditions for promoting multiple mitigation technologies simultaneously. It is pointed out that the barriers and proposed measures for e-scooters are similar to those for low-carbon cars (**Table 27**). Consequently, the TAP and PI for these mitigation technologies share many commonalities. Where applicable, the discussions that follow make reference to section 2.1.2 in order to avoid replication of information and to keep the TAP for e-scooters concise.

Summary of barriers and measures to overcome barriers

The barriers identified for e-scooters are identical to those for hybrid and electric cars shown in **Table** 27. The measures are, therefore, the same with the exception that a 2% subsidy on loan interest is proposed for e-scooters in order to overcome economic and financial barriers.

[10] It has been assumed that e-scooters will be used for trips that would otherwise be taken by cars.

Actions selected for inclusion in the TAP (e-scooters)
The measures for inclusion in the TAP for e-scooters were derived from the BAEF Report (Government of Seychelles, 2017b). The rationale used for selecting measures and for assessing their urgency for inclusion as Actions in the TAP is the same as for hybrid and electric vehicles (section 2.1.2).

Table 41 provides an assessment of the measures considered for inclusion in the TAP for Low Carbon Car Fleet. Because of their medium-to-high urgency, all the measures have been retained as Actions for the Low Carbon Car Fleet TAP. The measures are grouped by category of barriers.

Table 41. Assessment of measures for e-scooters.

Measures to overcome barriers	Assessment	Ranking
Financial & Economic Barriers A subsidy on loan interest for hybrid and electric cars	Unlike for hybrid and electric cars, there are currently no financial incentives to purchase an e-scooter. It is, therefore, crucial to provide an attractive financing mechanism to make the technology more affordable and attractive. Compared to conventional motorcycles, the e-scooter remains financially unattractive. Consequently, it is proposed that a rebate of 2% on interest rates for incremental loans to purchase an e-scooter be provided to buyers. The reasoning behind the proposed financial incentive is explained in **Table 28**.	high
Regulatory Barriers The establishing of a legal framework so that only authorised dealers are able to import low-carbon vehicles in the country	As in the case for low-carbon cars, it is important to regulate the market for e-scooters to increase consumer confidence and its acceptability.	high
Policy Barrier Formulating policies for promoting low-carbon motorised vehicles	There is a lack of coherent policy to promote electric vehicles in general. Since there is already a proposal to draft policies for promoting low-carbon cars, it is proposed that this opportunity be availed to cover e-scooters (and potentially other low-carbon/no carbon technologies).	Low
Human Capacity Barrier Training technicians for providing specialised technical services to owners of hybrid and electric vehicles	There are currently none or limited trained and qualified local experts to maintain and repair e-scooters. In order to build consumer confidence in the technology, it will be necessary to train qualified technicians for carrying out maintenance and repairs on e-scooters.	Medium

Source: TNA project

Activities identified for implementation of selected Actions
The measures identified with medium or high urgency in **Table 41** have been retained for inclusion as Actions in the TAP for e-scooter. As anticipated, the Actions and their accompanying Activities are identical to those for hybrid and electric cars shown in **Table 29**. Consequently, the table summarising the Actions and Activities for the e-scooter TAP has not been reproduced here.[11]

Actions to be selected as Project Ideas
The PI for e-scooter is the same as that for low-carbon cars. Action 1, Action 2 (Acivity 2.1) and Action 3 (Activity 3.2) have been selected as a PI for e-scooter based on the discussions given in section 2.1.2.

[11] In reading Table 30, the phrases 'hybrid and electric cars' and 'low carb cars' should be substituted with 'e-scooters'. Action 3 in Table 30 was made generic to cover e-scooters under 'electric vehicles'.

2.1.2.4 Stakeholders and Timeline for implementation of TAP

Overview of Stakeholders

The stakeholders who will be responsible to implement the TAP for e-scooter and their roles in the process are defined in **Table 30**.[12]

Scheduling and sequencing of specific activities

The TAP for e-scooter will follow the timeline shown in **Table 31** for hybrid and electric cars – i.e. planning and implementation in 2019 and 2020. In summary, the sequencing will be as follows:

Action 1: A subsidy on loan interest for e-scooters – The scheme will be set up early in the TAP implementation process (i.e. 2019) but its monitoring and review (Activity 1.3) will probably span most of the target period – i.e. 2030;

Action 2: Establish authorised dealership for e-scooters – Since the urgency is only moderate, this action will be implemented in 2020; and

Action 3: Training of qualified technicians to carry out repairs and maintenance –The activities will be initiated in year 2 (2019), with accredited trainings delivered in 2020.

2.1.2.5 Estimation of Resources Needed for Action and Activities

This section discusses the capacity building elements of the TAP, as well as an estimation of its implementation costs.

Estimation of capacity building needs

The dedicated capacity building (human and institutional) elements of the TAP are:

- Activity 1.3: Capacity building of the Department of Land Transport to review and update subsidy scheme;
- Activity 2.2: Carry out capacity building of car dealers on the strategy and guidelines; and
- Action 3: Training of qualified technicians to carry out repairs and maintenance on e-scooters.

Estimations of costs of actions and activities

The cost of each Activity constituting the TAP is provided in **Table 42**. Since the Actions and Activities retained for e-scooters are identical to those of low-carbon cars, and given that the Low-Carbon Car Fleet TAP is significantly more ambitious that the TAP for e-scooters, it would be meaningful to implement the latter as a sub-set of the TAP for Low-Carbon Car Fleet. With this approach in mind, the costs of activities in **Table 42** have been estimated using an incremental approach – i.e. the additional cost incurred by increasing the scope of the Low-Carbon Car Fleet TAP to also cover e-scooters.

The incremental cost to implement the TAP for e-scooters is estimated at US$ 19,500 that will be funded through a combination of cash/grant and in-kind financing. The incremental in-kind financing is estimated at US$2,000 for Activities 1.4 and 2.2. Therefore, US$ 17,500 is expected to be funded through the financial support of donors and development partners, including international climate finance sources.

The TAP does not cover the cost of the subsidy scheme. In carrying out the benefit cost analysis of e-scooters (Government of Seychelles, 2017b), the cumulative cost of the subsidy scheme to 2030 was estimated at ~US$ 0.68 million. The calculation assumed the cost of an e-scooter fixed at 2017 prices, and the subsidy scheme assumed to be implemented to 2030. A more realistic scenario would see falling prices over time, and elimination of the subsidy scheme before 2030. This is the reason for Activity 1.4 to review the performance of the subsidy scheme every year in order to avoid unnecessary economic losses due to changes in market conditions that might enhance the uptake of the technology without any financial incentive.

[12] Any references to low-carbon cars or hybrid and electric cars should be extended to cover e-scooters.

Table 42. Planning table - characterisation of activities for implementation of actions for e-scooters.

Action 1:	**A subsidy on loan interest for e-scooters**									
Activities	**Planning**				**Implementation**				**Costs and funding needs**	
	Start	Complete	Who	Capacity needs	Start	Complete	Who	Capacity needs	Costs (US$)	Who will fund
1.1 Hire a consultant to develop the subsidy scheme in consultation with all stakeholders	Q1-2019	Q1-2019	MFTEP, RTC, DoLT and SEC	Definition of Terms of Reference (ToR)	Q2-2019	Q4-2019	MFTEP and DoLT	None (provided by Services Provider / Consultant)	5,000	Donor / Development Partner
1.2 Seek formal approval of subsidy scheme in order to initiate implementation	Q4-2019	Q4-2019	MFTEP, RTC, DoLT and SEC	None	Q1-2020	Q2-2020	Cabinet of Ministers, Attorney General's Office, MFTEP and DoLT	None	none	Covered under TAP for Low-Carbon Car Fleet
1.3 Capacity building of the Department of Land Transport to review and update subsidy scheme	Q4-2019	Q4-2019	MFTEP, RTC, DoLT and SEC	None (covered under definition of ToR)	Q1-2020	Q1-2020	MFTEP and DoLT	None (training provided by Services Provider/Consultant)	2,000	Donor / Development Partner
1.4 Establish multi-stakeholder working group to carry out long term monitoring of the subsidies and ensure elimination of economic losses (this committee can	Q4-2019	Q4-2019	MFTEP, RTC, DoLT, SMVDA and SEC [*the multi-stakeholder group can also be the Steering Committee for the TAP implementation*]	Institutional coordination	2019	2021 (*to meet at least once a year after 2021*)	MFTEP, DoLT and SMVDA	None	1,000 (for first review in 2021) [*it is anticipated that there will be an annual review of the subsidy scheme at a cost of*	Government (MFTED and DoLT) (in-kind contribution)

also fulfil the conditions of Activity 2.3)									*US$4,000 per year*)[13]	
Action 2:	**Establish authorised dealership for e-scooters**									
Activities	**Planning**				**Implementation**				**Costs and funding needs**	
	Start	Complete	Who	Capacity needs	Start	Complete	Who	Capacity needs	Costs (US$)	Who will fund
2.1 Draft and approve strategy and guidelines for dealers in e-scooters	Q1-2020	Q1-2020	DoLT and RTC	Understanding the enabling conditions for market development	Q2-2020	Q3-2020	DoLT and RTC	Legal and regulatory frameworks for market development	1,500	Donor/development partner
2.2 Carry out capacity building of dealers in e-scooters on the strategy and guidelines	Q3-2020	Q4-2020	DoLT, RTC and SMVDA	Institutional coordination	Q4-2020	Q1-2021	DoLT, RTC and SMVDA	Delivery of training	1,000	DoLT and RTC (US$ 3,500 grant) SMVDA (US$1,500 in-kind)[14]
2.3 Set up committee to oversee the development of the market for e-scooters (*Uses the structure developed under Activity 1.4*).	Q4-2019	Q4-2019	DoLT, RTC and SMVDA	Institutional coordination	2019	2021 (*to meet at least once a year after 2021*)	DoLT, RTC and SMVDA	None (since the task forms part of the ongoing vehicles park monitoring by institutions)	Covered under budget for Activity 1.4	Covered under budget for Activity 1.4
Action 3:	**Training of qualified technicians to carry out repairs and maintenance**									
Activities	**Planning**				**Implementation**				**Costs and funding needs**	
	Start	Complete	Who	Capacity needs	Start	Complete	Who	Capacity needs	Costs (US$)	Who will fund

[13] This cost coves the review of the subsidy schemes for both low-carbon cars and e-scooters.

[14] The breakdown of contributions is for both low-carbon cars and e-scooters.

3.1 Hire consultant to carry out training needs assessment	Q2-2019	Q2-2019	SIT, DoLT and SMVDA	Definition of ToR to attract high calibre consultant	Q3-2019	Q2-2020	SIT, DoLT and SMVDA	Training needs assessment carried out by Services Provider/Consultant	2,000	Donor/development partner
3.2 Establish MOU with SIT for delivery of accredited training	Q3-2019	Q3-2019	DoLT, SMVDA and SIT	Institutional coordination	Q4-2019	Q4-2019	DoLT, SMVDA and SIT	None	none	Covered under TAP for Low Carbon Car Fleet
3.3 Develop technical training programme for e-scooters, including equipment	Q1-2020	Q1-2020	SIT, DoLT and SMVDA	Estimating human capacity gap and cost	Q2-2020	Q4-2020	SIT	None (since all necessary expertise is already available at SIT)	7,000 (US$5,000 for one e-scooter, and remaining budget for training material development)	Donor/development partner

Source: TNA project

2.1.4.6 Management Planning

This section identifies the risks to successful implementation of the TAP for e-scooters. Measures to mitigate the risks are also identified. It also identifies the immediate critical steps that would be required to initiate TAP implementation.

Risks and Contingency Planning

The risks and contingency planning for e-scooters are identical to those for low-carbon cars given in **Table 32**. Financial, cost escalation, scheduling, and technology performance risks have been rate as low.

Next steps

The immediate requirement to proceed with the implementation of the TAP and the proposed Project Idea (PI) is to obtain political support for the TAP. This can be secured through a two stage process, namely (1) obtaining Cabinet approval for the proposed TAP; and (2) setting up a Steering Committee (SC) that will oversee the execution of the TAP and PI. The oversight function will be carried out using the structure proposed for overseeing the execution of the TAP for Low Carbon Car Fleet.

The three critical steps that need to be controlled in order to promote the uptake of e-scooters are the same as those for electric and hybrid cars.

2.1.4.7 TAP overview table – e-scooter

The overview of the TAP for e-scooter is given in **Table 43**.

Table 43. TAP overview table for e-scooter.

Sector	**Energy**							
Sub-sector	Land transport							
Technology	Electric scooters (e-scooters)							
Ambition	By 2030, there will be an additional 1,500 e-scooters on the roads.							
Benefits	The sustainable development benefits of the TAP are: (1) (1) direct GHG emission reductions in 2030 of ~744 tCO_2 per year; and (2) an avoided cost on energy bill in 2030 of ~US$ 154,500. Because of the small size of Seychelles, land is a valuable and expensive commodity. Another benefit of the technology is that it does not entail incremental land use compared to conventional cars.							
Action	**Activities to be implemented**	**Sources of funding**	**Responsible body and focal point**	**Time frame**	**Risks**	**Success criteria**	**Indicators for Monitoring of implementation**	**Budget per activity**
Action 1: A subsidy on loan interest for e-scooters	Activity 1.1: Hire a consultant to develop the subsidy scheme in consultation with all stakeholders	Donor/development partner	DoLT and RTC	Q1-2020 to Q4-2020	Competent consultant to develop subsidy scheme will not be attracted	TA with adequate credentials and project references recruited	- Appointment of consultant - Subsidy scheme developed	5,000
	Activity 1.2: Seek formal approval of subsidy scheme in order to initiate implementation	DoLT and MFTEP	DoLT and MFTED	Q1-2020 to Q3-2020	Disagreement over the proposed subsidy scheme	Subsidy scheme approved by Attorney General's Office and Cabinet of Ministers	Number of customers benefiting from subsidy scheme	Covered under TAP for Low-Carbon Car Fleet
	Activity 1.3: Capacity building of the Department of Land Transport to review and update subsidy scheme	Donor / Development Partner	DoLT and MFTED	Q4-2019 to Q1-2020	Lack of interest and low absorption capacity of DoLT and MFTED	A total of 4 staff trained on analysing subsidy scheme	Number of staff trained	2,000
	Activity 1.4: Establish multi-stakeholder working group to carry out long term monitoring of the subsidies and ensure elimination of economic losses	Government (MFTED and DoLT)	MFTEP, DoLT and SMVDA	Q4-2019 to 2021	Lack of participation from key stakeholders	High stakeholder participation and annual review of subsidy scheme is carried out	- Number of stakeholder meetings and number of participants	1,000

							- Result of annual review of subsidy scheme	
Action 2: Establish authorised dealership for e-scooters	Activity 2.1: Draft and approve strategy and guidelines for dealers in e-scooters	Donor/ Development partner	DoLT and RTC	Q1-2020 to Q3-2020	Lack of political support for setting up authorised dealership, and strategy not approved by key stakeholders	Strategy and guidelines developed and adopted by stakeholders	Number of approved strategy and guidelines	1,500
	Activity 2.2: Carry out capacity building of dealers in e-scooters on the strategy and guidelines	DoLT and RTC (US$ 3,500 grant) SMVDA (US$1,500 in-kind)	DoLT, RTC and SMVDA	Q3-2020 to Q1-2021	Lack of interest from members of SMVDA	At least 5 local authorised dealers trained on strategy and guidelines	Number of dealers trained	1,000
	Activity 2.3 Set up committee to oversee the development of the market for low-carbon cars	DoLT, RTC and SMVDA	DoLT, RTC and SMVDA	Q4-2019 to 2021	Low participation from stakeholders	Annual market review completed with high participation of TAP stakeholders	- Number of market reviews carried out - Number of participants in reviews	Covered under budget for Activity 1.4
Action 3: Training of qualified technicians to carry out repairs and maintenance	Activity 3.1: Hire consultant to carry out training needs assessment	Donor/developme nt partner	SIT, DoLT and SMVDA	Q2-2019 to Q2-2020	Inability to attract high calibre consultant to carry out training needs assessment	Training needs assessment completed	Number and type of training required	2,000
	Activity 3.2: Establish MOU with SIT for delivery of accredited training	Government (SIT and DoLT) (in-kind contribution)	DoLT, SMVDA and SIT	Q3-2019 to Q4-2019	Lack of interest from stakeholders to enter into an agreement over training needs and delivery	MOU signed between parties	Number of MOU signed	Covered under TAP for Low Carbon Car Fleet
	Activity 3.3: Develop technical training programme for electric	Donor/developme nt partner	SIT	Q1-2020 to Q4-2020	Lack of interest or capacity for	- Training, including required	- Number of training developed	7,000

	vehicles, including equipment				setting up and delivering course by SIT or lack of interest from authorised dealers to train their personnel through the SIT	- laboratory equipment, established - 10 technicians trained from between 3-5 authorised dealers	- Value of laboratory equipment/assets purchased using TAP funding - Number of technicians trained	((US$5,000 for one e-scooter, and remaining budget for training material development)

Source: TNA project

2.2. Project Ideas for Land Transport

This section presents project ideas (PIs) that contain quick win actions that support the realisation of the overall targets indicated in the two TAPs discussed above. Before presenting the PIs in section 2.2.2, the following section provides a discussion of how the PIs were identified and developed, and how they can contribute to the transfer, diffusion, and deployment targets of relevant mitigation/adaptation technologies.

2.2.1 Brief summary of the Project Ideas for Land Transport

The TAPs described in this document are designed with specific Actions and Activities in mind that are interrelated and will together contribute to the successful achievement of the proposed technology targets. The approach used for identifying Actions/Activities for inclusion in PIs has been outlined in section 2.1.2, while noting that the same approach was adopted for all TAPs, and that the TAP for e-scooters will be implemented as a sunset of the TAP for Low Carbon Car Fleet. The PIs presented in section 2.2.2, therefore, provide 'must-haves' in order to achieve the proposed technology targets as they offer 'quick wins' and provide the enabling conditions for technology diffusion.

Two PIs have been proposed for land transport based on the discussions under the sections above on 'Actions to be selected as Project Ideas'. They are:

1. **Project Idea 1 – Enabling conditions for promoting low-carbon vehicles:** The PI will cover hybrid and electric cars, and e-scooters. It aims to stimulate market demand for these mitigation technologies through financial incentives in the form of a subsidy on loan interest, which is then expected to create the pull for other market conditions, such as a regulatory framework for authorised dealers in low-carbon vehicles for ensuring adequate after sales services, and training qualified technicians for the maintenance and repairs on these vehicles; and
2. **Project Idea 2 – Catalysing implementation of the VTMP:** The design of the PI recognizes that the VTMP is a complex undertaking that deals with physical development that involves a multitude of stakeholders. Its implementation therefore requires two conditions, namely: (1) that there is a high-level cross-sectoral stakeholders' coordination structure that allows all parties to participate in planning and implementation; and (2) that the VTMP should be embedded in a national strategic plan, such as the Seychelles Strategic Plan (SSP) that guides the physical development in Seychelles. The latter will be necessary for the buy-in from all relevant stakeholders.

2.2.2 Specific Project Ideas

The PIs draw from the TAPs summarised in **Table 33**, **Table 40** and **Table 43**. The PIs are summarised in **Table 44** and **Table 45.**

Table 44. Project Idea 1 – Enabling conditions for promoting electric vehicles.

Introduction/ Background	The enabling conditions for hybrid and electric cars (TAP for Low Carbon Car Fleet) and e-scooters (TAP for e-scooters) are identical. Since the ambition of the TAP for e-scooters is significantly smaller than that for low-carbon cars, it is most meaningful to implement the TAP for e-scooters as a subset of the TAP for Low Carbon Car Fleet. There is first a need to stimulate market demand for these technologies that are consumer goods, and the most effective way is to provide a financial incentive to lower their upfront costs that are relative high when compared to conventional motorised vehicles. Once market demand has been stimulated it will be necessary to increase consumer confidence in the products by: (1) ensuring that low-carbon vehicles are traded by authorised dealers that will be in a position to provide product warranty and guarantee adequate after sales services; and (2) ensuring that accredited technicians are available for carrying out maintenance and repairs of products.
Objectives	1. To create market demand for low-carbon vehicles 2. To enhance consumer confidence in low-carbon vehicles

<table>
<tr><td>What are the outputs and are they measurable?</td><td>All the outputs are measurable as indicated by objectively verifiable indicators in the TAPs. The main outputs are:
1. A technology-specific subsidy is provided on loan interest
2. A strategy and guidelines for low carbon vehicle dealership are developed
3. Establishing a formal agreement with SIT at an early stage for delivering accredited training on the repair and maintenance of low-carbon motorised vehicles</td></tr>
<tr><td>Relationship to the country's sustainable development priorities</td><td>The Government of Seychelles has submitted its Nationally Determined Contribution (NDC) to the UNFCCC, and NDC is also supportive of SDG13. Facilitated by the proposed PI, the TAPs can be used to inform the post-2018 dialogues planned under the 'ratchet mechanism'[15] to increase the ambition of the mitigation targets that were proposed in the NDC. As such, the PI can play a significant role in the review process of the first NDC.</td></tr>
<tr><td>Project Deliverables e.g. Value/Benefits/Messages</td><td>1. Reducing financial barriers is a productive (efficient and effective) means of increasing market demand for hybrid and electric cars, and e-scooters
2. Consumer confidence in mitigation technologies can be enhanced by regulating their market through authorised dealers, and ensuring adequate after sales services</td></tr>
<tr><td>Project Scope and Possible Implementation</td><td>The project is narrowly focused in order to increase its chances of success. It builds on existing market development for hybrid and electric cars that already benefit from fiscal incentives. These fiscal incentives will be supplemented by financial and non-financial incentives. The scope of product will be increased using an incremental approach for e-scooters.</td></tr>
<tr><td>Project activities</td><td>The activities are taken directly from the TAPs in order to show the coherence between TAPs and PIs:
1. Hiring a consultant to develop the subsidy scheme in consultation with all stakeholders
2. Seeking formal approval of subsidy scheme in order to initiate implementation
3. Drafting and approving strategy and guidelines for low carbon vehicle dealership
4. Establish MOU with SIT for delivery of accredited training (through a certification programme)</td></tr>
<tr><td>Timelines</td><td>By virtue of being quick wins, the activities are expected to be carried out between 2019 and 2020 (or 2 years within start of implementation)</td></tr>
<tr><td>Budget/Resource requirements (What is the budget? How is the project to be funded? /Staff, Engaging consultants, partnership, etc.)</td><td>
<table>
<tr><th>Activity</th><th>Budget (US$)</th><th>Means of implementation</th></tr>
<tr><td>Developing subsidy scheme</td><td>40,000</td><td>Consultants with participation of staff from MFTEP, DoLT and SEC</td></tr>
<tr><td>Approval of subsidy scheme</td><td>1,500</td><td>Cabinet of Ministers, Attorney General's Office, staff of MFTEP and DoLT</td></tr>
<tr><td>Framework for authorised dealers</td><td>11,500</td><td>Staff of DoLT and RTC</td></tr>
<tr><td>Partnership for developing and delivering accredited training for technicians</td><td>1,500</td><td>Staff of DoLT, SMVDA and SIT</td></tr>
</table>
</td></tr>
<tr><td>Measurement/ Evaluation (What tangible evaluation of accomplishments will be conducted? How will the success be measured?)</td><td>
<table>
<tr><th>Activity</th><th>M&E Indicators</th><th>Sources of verification</th></tr>
<tr><td>Developing subsidy scheme</td><td>- Appointment of consultant
- Subsidy scheme developed</td><td>Project M&E reports</td></tr>
<tr><td>Approval of subsidy scheme</td><td>Number of customers benefiting from subsidy scheme</td><td>Government Gazette</td></tr>
<tr><td>Framework for authorised dealers</td><td>Number of approved strategy and guidelines</td><td>Project M&E reports</td></tr>
<tr><td>Partnership for developing and delivering accredited</td><td>Number of MOU signed</td><td>Project M&E reports</td></tr>
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[15] https://www.carbonbrief.org/timeline-the-paris-agreements-ratchet-mechanism - accessed 8 May 2018.

<table>
<tr><td></td><td>training for technicians</td><td></td><td></td></tr>
<tr><td>Possible Complications/ Challenges</td><td colspan="3"><table>
<tr><th>Activity</th><th>Challenges</th></tr>
<tr><td>Developing subsidy scheme</td><td>Competent consultant to develop subsidy scheme will not be attracted</td></tr>
<tr><td>Approval of subsidy scheme</td><td>Disagreement over the proposed subsidy scheme leads to scheme not being approved</td></tr>
<tr><td>Framework for authorised dealers</td><td>Lack of political support for setting up authorised dealership, and strategy not approved by key stakeholders</td></tr>
<tr><td>Partnership for developing and delivering accredited training for technicians</td><td>Lack of interest from stakeholders to enter into an agreement over training needs and delivery
Lack of interest or capacity for setting up and delivering course by SIT or lack of interest from authorised car dealers to train their personnel through the SIT</td></tr>
</table></td></tr>
<tr><td>Responsibilities and Coordination</td><td colspan="3">Having the mandate for policy making in the land transport sub-sector, the DoLT will be responsible for taking the lead in seeking political support for the proposed subsidy scheme for low-carbon vehicles. The MTFEP will be a key partner in developing the subsidy scheme, and to ensure its approval at the highest level.

DoLT and RTC will be responsible for developing the strategy and guidelines for authorised dealership in the mitigation technologies. The SIT and SMVDA will be key players for partnership on accredited training development and delivery.</td></tr>
</table>

Source: TNA project

Table 45. Project Idea 2 – Catalysing implementation of the VTMP.

Introduction/ Background	Victoria hosts a dense traffic and congestion is on the rise. Proper traffic management can ensure that traffic flows smoothly and efficiently; there is fair access for different transport modes; roads and streets are safe for all users; roads full of motorised traffic do not constitute barriers blocking movement between areas; congestion, local pollution and noise are minimised; neighbourhoods, pedestrian areas and the overall character of localities are protected from the negative impact of high traffic levels; and greenhouse gas is reduced. The VTMP is proposed as a means to deal with this problem. Because of its complexity, implementation requires that: (1) there is a high-level cross-sectoral stakeholders' coordination structure that allows all parties to participate in planning and implementation; and (2) the VTMP should be embedded in a national strategic plan, such as the Seychelles Strategic Plan (SSP) that guides the physical development in Seychelles. The latter will be necessary for the buy-in from all relevant stakeholders.
Objective	To support implementation of the VTMP using an evidence-based approach and high-level, cross-sectoral coordination
What are the outputs and are they measurable?	All the outputs are measurable as indicated by objectively verifiable indicators in the TAPs. The main outputs are: 1. Technical options such as bridges, over passes and roads built on pillars as alternatives to land reclamation are investigated 2. The Seychelles Strategic Plan is updated and endorsed as the formal physical development plan of Seychelles
Relationship to the country's sustainable development priorities	The Government of Seychelles has submitted its Nationally Determined Contribution (NDC) to the UNFCCC, and NDC is also supportive of SDG13. Facilitated by the proposed PI, the TAPs can be used to inform the post-2018 dialogues planned under the 'ratchet mechanism'[16] to increase the ambition of the mitigation targets that were proposed in the NDC. As such, the PI can play a significant role in the review process of the first NDC.

[16] https://www.carbonbrief.org/timeline-the-paris-agreements-ratchet-mechanism - accessed 8 May 2018.

<table>
<tr><td>Project Deliverables e.g. Value/Benefits/Messages</td><td>1. Using an evidence-based approach to justify investments in the VTMP
2. Ensuring that there is ownership in the implementation of the VTMP by first anchoring the VTMP in an updated and endorsed SSP, and putting in place an inter-ministerial oversight committee to provide political support for the VTMP</td></tr>
<tr><td>Project Scope and Possible Implementation</td><td>The project is narrowly focused in order to increase its chances of success. It builds on existing efforts that have been carried out to develop the SSP 2040, and to galvanise high-level political support for the implementation of the VTMP within the scope of the SSP.</td></tr>
<tr><td>Project activities</td><td>The activities are taken directly from the TAPs in order to show the coherence between TAPs and PIs:
1. Carrying out financial, economic and technical study of using bridges, over passes and roads built on pillars as alternatives to land reclamation
2. Implementing real time traffic monitoring in and around Victoria
3. Reviewing and updating the SSP and VTMP in light of the findings in 1 and 2
4. Drafting and approving ToR for inter-ministerial oversight committee
5. Securing resources for operationalising the oversight committee
6. Establishing a schedule of meetings, and a monitoring and evaluation framework for the committee's oversight of VTMP implementation</td></tr>
<tr><td>Timelines</td><td>By virtue of being quick wins, the activities are expected to be carried out between 2019 and 2020 (or 2 years within start of implementation)</td></tr>
<tr><td>Budget/Resource requirements (What is the budget? How is the project to be funded? /Staff, Engaging consultants, partnership, etc.)</td><td>
<table>
<tr><th>Activity</th><th>Budget (US$)</th><th>Means of implementation</th></tr>
<tr><td>Alternatives to land reclamation</td><td>90,000</td><td>Consultant</td></tr>
<tr><td>Real time traffic monitoring</td><td>50,000</td><td>Staff of DoLT and SLPA</td></tr>
<tr><td>Review and update SSP and VTMP</td><td>75,000</td><td>Consultant and staff of SPA</td></tr>
<tr><td>ToR oversight committee</td><td>2,000</td><td>Staff of DoLT and SLPA</td></tr>
<tr><td>Resources mobilisation for oversight committee</td><td>15,000</td><td>Staff of DoLT, SLTA, SPA, MFTEP</td></tr>
<tr><td>Work plan for oversight committee</td><td>10,000</td><td>Staff of DoLT</td></tr>
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<tr><td>Measurement/ Evaluation (What tangible evaluation of accomplishments will be conducted? How will the success be measured?)</td><td>
<table>
<tr><th>Activity</th><th>M&E Indicators</th><th>Sources of verification</th></tr>
<tr><td>Alternatives to land reclamation</td><td>Number of studies completed and approved by SC</td><td>Project M&E reports</td></tr>
<tr><td>Real time traffic monitoring</td><td>- Number of monitoring systems installed
- Number of instances when data from real time monitoring is used in development planning</td><td>Project M&E reports</td></tr>
<tr><td>Review and update SSP and VTMP</td><td>SSP and VTMP are reviewed and updated to the satisfaction of the SC</td><td>Project M&E reports</td></tr>
<tr><td>ToR oversight committee</td><td>VTMP oversight committee constituted with very high level inter-ministerial membership</td><td>Project M&E reports</td></tr>
<tr><td>Resources mobilisation for oversight committee</td><td>Amount of resources (financial and human) mobilised by source</td><td>Project M&E reports</td></tr>
<tr><td>Work plan for oversight committee</td><td>High quality work plan and M&E framework developed with high institutional and political buy-in</td><td>Project M&E reports</td></tr>
</table>
</td></tr>
<tr><td>Possible Complications/ Challenges</td><td>
<table>
<tr><th>Activity</th><th>Challenges</th></tr>
<tr><td>Alternatives to land reclamation</td><td>Low quality ToR results in the recruitment of low profile services provider</td></tr>
<tr><td>Real time traffic monitoring</td><td>Real time monitoring is ineffectively used due to a combination of low quality equipment and low capacity to measure and use data</td></tr>
<tr><td>Review and update SSP and VTMP</td><td>Inability to attract high quality services provider to update SSP and VTMP</td></tr>
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	ToR oversight committee	Poor quality of ToR leads to sub-optimal oversight on VTMP planning and implementation
	Resources mobilisation for oversight committee	Inability to secure human and financial resources to operationalise the oversight committee
	Work plan for oversight committee	Poor work plan and M&E framework developed leading to inefficient operation of oversight committee
Responsibilities and Coordination	The DoLT and SLPA will have the responsibility for leading the implementation of this PI, as well as carrying out stakeholder coordination. The SPA will bear the responsibility for reviewing and endorsing the SSP.	

Source: TNA project

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Annex 1. List of stakeholders involved and their contacts

POWER SECTOR

Name	Contact details	Affiliation	Approach of consultation	Topics
• Tony Imaduwa	timaduwa@sec.sc	SEC	Bilateral	List of applicable technologies for the power sector
• Cynthia Alexander	calexander@sec.sc	SEC	Workshop participant	Status of EE and RE in Seychelles
• Laurent Sam	lsam@puc.sc	PUC	Workshop participant	Technologies implemented (or planned) by PUC
• Kalsey Belle	kbelle@puc.sc	PUC	Workshop participant	Technologies implemented (or planned) by PUC
• Anil Singh	asingh@puc.sc	PUC	Bilateral	Integration of variable RE into the grid
• Christian Fleischer	Chris-fleischer@hotmail.com	MSc Student	Workshop participant	Large-scale energy storage for grid stabilisation
• Theodore Marguerite	t.marguerite@gov.sc	DECC	Bilateral	Policy and technology options
• MamyRazanjatovo	rmazanajatovo@sec.sc	SEC	Workshop participant	Energy modeling and forecasting
• Guilly Moustache	gmoustache@sec.sc	SEC	Bilateral	Energy information
• Ravin Sunnassee	rsunnassee@puc.sc	PUC	Bilateral	Electricity generation options
• Emanuele De Stefani	emanuele.destefani@gmail.com	Private sector	Workshop participant	Status of supply of PV equipment
• Bertrand Rassool	lbmrassool@yahoo.co.uk	Private sector	consulted	Status of energy sector and technology forecasts

LAND TRANSPORT

Name	Contact details	Affiliation	Approach of consultation	Topics
1. Desire PAYET	dpayet@slta.sc	SLTA	TWG	Implementing policies and road infrastructure
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